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A Worth-while Programme

Last week, Mr. F. W. Rowe, the newly-elected chairman of the British Steel Founders' Association, presided over a Press conference held for the dual purpose of releasing a report of the recent productivity convention held at Ashorne Hill (which is printed elsewhere in this issue) and to disclose plans for giving effect to the conclusions reached. The first matter to be borne in mind is that the delegates to this conference unanimously accepted the principles and recommendations of the Report of the team which visited America. Amongst the recommendations put forward at Ashorne Hill and which are being investigated by the executive are:—(1) Availability of supplies of low-sulphur and -phosphorus scrap; (2) provision of increased electric power, and (3) power-rate charge.

A committee has been formed to deal with productivity, but this one is initially assured of success because it is to operate under the dynamic leadership of Mr. Frank Martin, the immediate past-chairman of the B.S.F.A. His record is such that, unless "restrictive practices" raises its ugly head, real progress can be anticipated. Another question to be brought up is the simplification of the method of paying wages. At the moment, it is admitted by everybody in the industry that the system is far too complicated. Perhaps a little belated, the home industry is to be visited and reported upon in a like manner to the treatment given to American conditions. We are sure that much good can arise from this activity, because any feature showing real potentialities can be investigated in the greatest detail and moreover it is readily available for examination by interested parties other than team members. Finally, a research department is to be set up, but of a type different from those currently in existence. Because the industry is reasonably small and compact, it should be quite possible to find where good or even the best practice exists and then to propagate its use as widely as possible. The French system of finding statistically where process costs are high or low could usefully be followed. However, the industry will be able to learn just what has happened when the second productivity convention takes place early next Spring. We hope that by that time a report of the same calibre as the earlier one will be available for discussion, together with some notes as to progress already realised.

Mr. Martin, in answer to a question, said "only one trade union has so far commented on the productivity team's report and its attitude appears to be that greater stress should have been laid upon the need to improve working conditions in foundries. As this had already been covered in the details by the Garrett Report—with which the employers were in agreement—the team concentrated more on other aspects of the productivity problem." To implement the Garrett Report whilst neglecting the Productivity Report, would be merely making a short cut to Carey Street, for some of the recommendations of the former—the installation of bathing facilities, for instance—must add materially to the overhead charges. Overhead charges have to be paid for from profits and these arise from production. Thus the inital stress must be laid upon productivity.

Contents

A Worthwhile Programme, 703.—General Ironfounders' Productivity Team, 704.—Dinner, 704.—Forthcoming Events, 704.—Latest Foundry Statistics, 704.—Manufacture of Ingot Moulds in Cement Sand, 705.—British Steel Founders' Association, 710.—Correspondence, 716.—What is Acicular Cast Iron?, 717.—Light Metal Founders' Association, 722.—Book Review, 723.—Publications Received, 723.—Blasting (Castings and other Articles) Special Regulations, 1949, 724.—Australian Industry and German Reparations, 725.—World Iron and Steel Industry—Employment, 726.—Parliamentary, 727.—Steel no longer in Short Supply, 727.—Obituary, 727.—Carbon-lined Blast Furnaces, 727.—Increases of Capital, 728.

General Ironfounders' Productivity Team

The following is the composition of the general ironfounders' team shortly to leave for America under the auspices of the Anglo-American Council of Productivity:—

Supervisory Group:—Mr. S. H. Russell, team leader (director and chairman, S. Russell & Sons, Limited, Leicester), Mr. H. B. Farmer (director and works manager, Rice & Company (Northampton), Limited), Mr. A. Kirkham (works manager, Sir W. H. Bailey & Company, Limited, Patricroft), Mr. M. Martin (foundry foreman, Markham & Company, Limited, Chesterfield), and Mr. G. W. Nicholls (general manager, foundries and patternshop, Modern Foundries, Limited, Halifax).

Technical Group:—Dr. H. T. Angus (development manager, British Cast Iron Research Association), Mr. N. Charlton (chief foundry metallurgist, C. A. Parsons & Company, Limited, Newcastle-upon-Tyne), Mr. W. R. Marsland (foundry technician, Newman Hender & Company, Limited, Woodchester, Gloucester), Mr. W. B. Parkes (assistant development manager, British Cast Iron Research Association), and Mr. E. J. Ross (foundry technician, G. & J. Weir, Limited, and Argus Foundry, Limited, Thornliebank, Glasgow).

Workshop Group:—Mr. C. Blackburn (moulder, T. H. & J. Daniels, Limited, Stroud, Glos.), Mr. H. Hendy (Davy & United Engineering Company, Limited, Sheffield), Mr. R. M. Lumsden (patternmaker, Fraser & Chalmers Engineering Works, Erith, Kent), and Mr. J. Stewart (moulder, A. F. Craig & Company, Limited, Paisley).

Mr. G. B. Judd, partner, Mann, Judd & Company, Chartered Accountants, London, will act as secretary. Before leaving for the States the team is to visit foundries in Scotland, Birmingham, London and the West of England.

Latest Foundry Statistics

The November Bulletin of the British Iron and Steel Federation shows that the trend of employment is downward. The reduction during September was 596; of these, 361 were males. The average employment in the steel foundries during the week ending October 8 was 19,388 and shows a gain of 220; twenty more females were employed. The weekly average production of metal for the making of steel castings during the month of October, however, was slightly less at 1,600 tons, the September figure being 1,660. There is, however, a distinct improvement on October, 1948, when the production was of the order of 1,490 tons. Furthermore, for the 10 months, this average weekly production is running at 140 tons better than last.

THE FRENCH foundry bond manufacturers' association and the French foundry employers' federation are jointly issuing a quality guarantee label for the productions of the former organisation to bear the mark "Aglofran."

Forthcoming Events

DECEMBER 19.

Sheffield Society of Engineers and Metallurgists.

"Steel and the Electron Microscope," by G. A. Geach, M.Sc., Ph.D., at the Royal Victoria Station Hotel, Sheffield, at 6.15 p.m.

Institution of Works Managers.

Sheffield Branch:—"Industrial Efficiency," by L. C. Ord, at the Royal Victoria Hotel, Sheffield, at 7 p.m.

Institution of Production Engineers.

Manchester Section:—"Control of Overhead Costs," by T. G. Rose, M.I.P.E., M.I.Mech.E., F.I.I.A., at the College of Technology, Sackville Street, Manchester, at 7.15 p.m.

Derby Sub-section:—"Induction Heating," by W. S. G. Cosgrave, B.Sc., A.I.M., at the School of Art, Green Lane, Derby, at 7 p.m.

DECEMBER 21.

Edinburgh Section:—"Scotland's New Industries," by C. A. Oakley, B.Sc., Ed.B., at the North British Station Hotel, Edinburgh, at 7.30 p.m.

Institute of Vitreous Enamellers.

Northern Section:—"Furnace Atmospheres in Vitreous Enamelling," by S. E. A. Ryder, at the Queens Hotel, Manchester, at 7 p.m.

DECEMBER 23.

Institute of British Foundrymen.

Falkirk Section:—"Non-ferrous Practice in a Mixed Foundry," by J. G. Boyle, at the Temperance Café, Lint Riggs, Falkirk, at 7 p.m.

Dinner

The Worshipful Company of Founders

The company gave a dinner at the Skinners' Hall, last Tuesday night in honour of the Lord Mayor (Sir Frederick Rowland) and Sheriffs. The Master (Mr. A. P. L. Blaxter, M.A.), presided. Amongst those present were: Sir Frank Newsam; Mr. S. Vyvian Hicks; Air Marshall Sir Aubrey Ellwood; Mr. Maurice Fitzgerald; Mr. Terence Donovan; Mr. H. Weston Howard; Mr. Christopher Hollis, M.P.; Lt.-Col. Dudley Lewis; Mr. Joseph Turner; Mr. Norman Neville; Sir Harry Gilpin; Mr. Duncan C. L. Fitzwilliams; Capt. (S) H. F. Koelle, R.N.; Mr. E. J. Hicks; Mr. L. H. Conbould-Ellis (immediate past master); Mr. T. L. Silverson; Mr. Alderman and Sheriff C. L. Ackroyd; Mayor and Sheriff Stanley W. Wells; Mr. F. A. Greene (upper warden); Mr. H. C. Bradbrook (under warden); Mr. H. Wilson Wiley (the clerk); Mr. R. W. Hatswell (past master); Mr. A. Stanley Young (past master); Lord Rathcreedan; Mr. F. W. Rowe; Sir Paul M. Booth; Dr. J. G. Pearce; Mr. G. B. Judd; Mr. James Shaw; Mr. P. H. Wilson; Mr. F. Arnold Wilson; Dr. J. E. Hurst; Mr. Malcolm Glenny; Mr. J. W. Gardom; Mr. R. B. Templeton; Mr. D. Howard Wood; Mr. V. C. Faulkner; Mr. F. A. Martin, and Lt.-Col. R. S. Scott.

CHAMBERLAIN INDUSTRIES, LIMITED, of Staffa Road, Leyton, E.10, report that some very interesting orders have recently been handled by their "Plant" Division. Outstanding among these are orders for London, Liverpool, Australia, East Africa, Norway, and South America.

Manufacture of Ingot Moulds in Cement Sand*

By J. G. P. Bruschke

The Author describes the making of ingot moulds of the "slab" type weighing between 2½ and 4½ tons. Fig. 1 shows the shape of the castings and Table I the main dimensions of the three sizes made.

TABLE I.—*Approximate Dimensions of Plate Ingot Moulds.*

Type.	"A," in.	"B," in.	"C," in.	"D," in.	Weight, tons.
1.	36	15	65	39.5	2.75
2.	43	17.5	65	43.5	3.34
3.	52	20	65	49	4.52

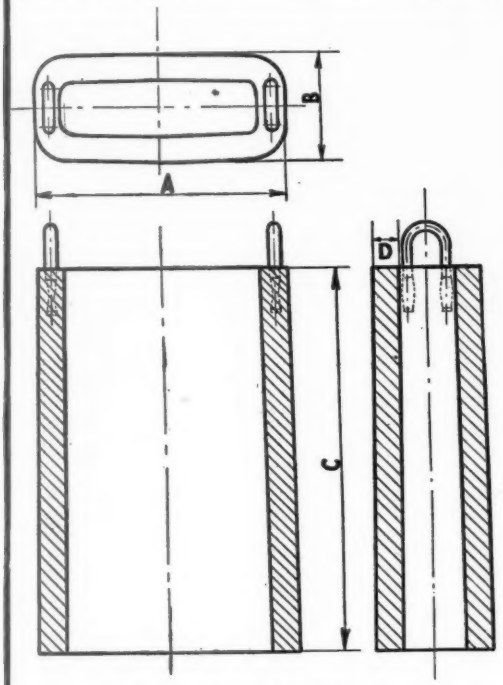

FIG. 1.—PLATE INGOT MOULD.
(See TABLE I for Dimensions.)

*Extracted from a Paper presented at the International Foundry Congress, Amsterdam, 1949.

FIG. 2.—MOULDS IN PROGRESS LET INTO THE FLOOR OF THE FOUNDRY.

The castings are moulded in a pit constructed of reinforced concrete, which is just wide enough to take the iron pattern, leaving a 6-in. gap at either side at ground level, and 3 in. at the bottom. The pattern is centred by lowering it over a concrete plinth, it is about ¼ in. thick and carries wooden strips at both ends. These fit snugly round the plinth. The pattern, initially, is removed from the pit for cleaning purposes, and for applying a coating of kerosene.

Moulding

After replacing the pattern, wide end downwards in the pit, a cast-iron grid, carrying four lifting hooks, a little shorter than the total height of the mould, is

Making Ingot Moulds in Cement Sand

placed on the bottom of the pit. Before ramming up the interspace, the wall of the pit is lined with boards, leaving a 4-in. gap between each. The cement sand is shovelled in and lightly rammed, using wooden rammers. At about two-thirds finished height, a core is included on the narrow sides, giving such data as serial number, type, and the like. About 8 in. from the top, a loose cast-iron grid is included. After filling is completed, the upper part of the mould is made level with the floor.

Two hours after filling, the boards are withdrawn to permit of air circulation, and about 20 hrs. later the mould is withdrawn and placed on a rack to dry. The next day it is blackwashed and stored for a minimum of three days.

Core-making

At the bottom of the core is a base-piece, about 4 in. thick. Its overall dimensions correspond with the external dimensions of the mould at its base. The taper is also of the same order. The core box is of reinforced concrete and is split vertically. At the bottom of each half core box is a cast-iron bearing plate carrying the necessary reinforcements. The two half core boxes are placed on a cast-iron floor plate—recessed to carry the base piece.

FIG. 3.—STOCK OF FINISHED MOULDS.

FIG. 4.—FINISHED CORES.

There are grooves incorporated in the floor plate, which are arranged to take the strips which are fastened to the underside of the core base-piece, thereby ensuring the correct positioning of the core in relation to the base-piece. The manœuvring of the core box can be done without resort to the overhead crane, as the sides of the supporting plates and the floor plate are provided with holes, by which they can be shifted by means of a steel bar. In the recess at the bottom of the opened core box there are two lifting hooks terminating a few centimetres from the top of the job. This recess is first filled in with cement sand and made level with the upper side of the floor plate. The core box being closed, pipes are placed around the lifting hooks and in the centre. Then the core box is filled with sand and lightly rammed. Two hours after filling the pipes are withdrawn and 20 hrs. later the core is taken from its box. Fig. 2 shows a group of moulds in the making, Fig. 3 a stock of finished moulds, and Fig. 4 a stock of cores.

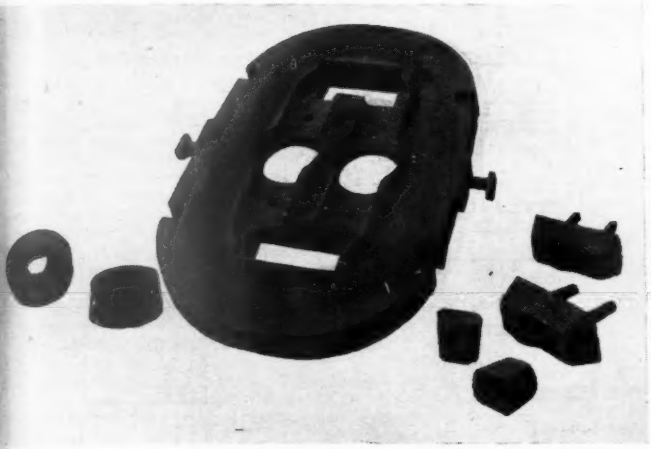

FIG. 5.—CAST-IRON COVER PLATE WITH CORES TO FORM THE LUGS, RUNNERS AND RISERS.

Assembly

A cast-iron jacket, about 6 in. thick and of the same height as the core plus its base-piece, is placed in the pit on a cast-iron plate so that about one-fifth extends above floor level. The interior dimensions of the jacket correspond with the exterior dimensions of the mould.

Initially, the jacket is placed on the cleaned plate. A week-old core is lowered into the jacket, and as the base-piece has the same dimensions as the jacket, it is thus centralised. Around the core, a three-day-old mould is placed. Its position is likewise fixed. To prevent mould breakage during pouring, the grooves resulting from the use of the boards are filled in with reclaimed cement sand. For closing the moulds, a cast-iron cover, 3 in. thick, is used. It carries on its face an annular ring about 6 in. wide and 2 in. deep. There are apertures in the plate for such details as runner cups, risers and lifting hooks. The ingot mould lugs are formed by means of a core rammed up in cement sand. It fits snugly into a prepared recess in the cover plate. The lug cores are held in position by a wedge inserted between them and the plate.

Runners and Risers

The runners, placed centrally in the long sides of the ingot mould, terminate in cores, inserted in openings in the cover. These are held in place by putting a layer of loam on the outside of the cover and pressing it home. Finally, the recess in the cover is filled with cement sand and made level with the underside of the cover. As the cover is warm, the sand can be blackwashed almost immediately. Using locating pins, the cover is placed on the jacket, after putting blobs of clay covered with strips of wet paper along the outline of the core and mould. The cover is then lifted, the

FIG. 6.—POURING OPERATION IN PROGRESS.

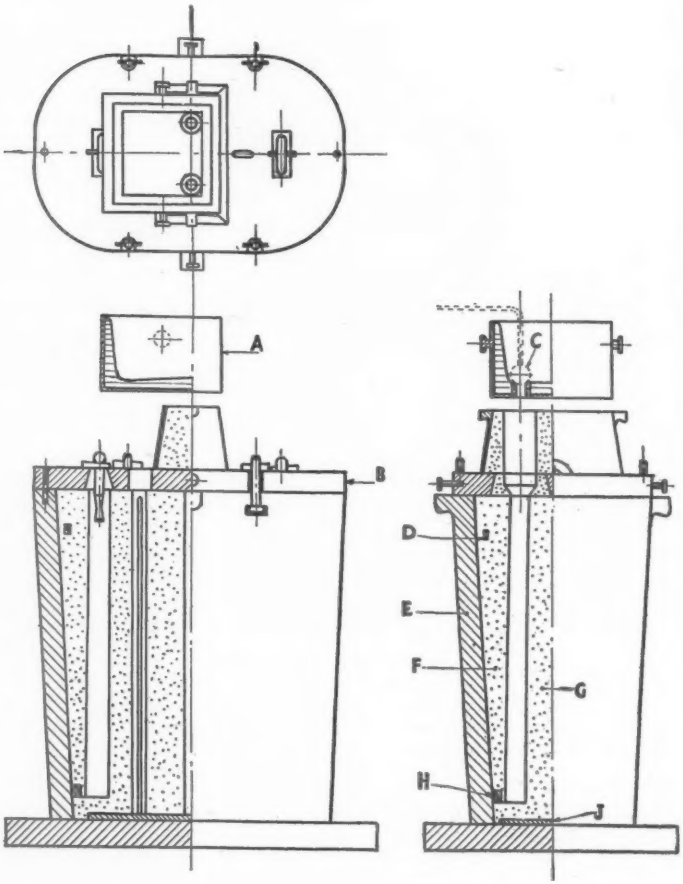

FIG. 7.—PART SECTION THROUGH THE ASSEMBLED MOULD.

A: Pouring basin.
B: Cover.
C: Ball plug.
D: Loose cast-iron grid.
E: Jacket.
F: Mould.
G: Core.
H: Cast-iron grid with lifting eyes for the mould.

paper and the surplus clay removed, and the cover replaced.

A riser box is attached to the cover using a clay seal, and about three inches above this box a runner basin is placed. This basin is quite separate from the rest of the mould. Centrally placed in the riser are downgates formed in cement-sand cores. The iron falls from the pouring basin into the riser box and then into the mould, ball plugs being used to control the initial entry of the metal. The pouring basin carries a highly refractory patching so that it will serve for 10 to 12 casts. Fig. 5 shows the cast-iron cover, with its complement of cores, and Fig. 6 shows the pouring operation. Fig. 7 is a part section through a completed mould.

Stripping

Two hours after pouring, the riser box is stripped, cleaned and prepared for use the next day. The removal of the cover follows, and the exposed part of the ingot mould is covered with dry sand. The recess in the cover is cleaned and re-prepared for use on the following day. About 12 hours after pouring, the casting, which continues over three days, after which the casting is fettled and despatched. Using a stock of four moulds and five cores of each type, one casting of each type can be made daily. To attain such a

production, the moulding is so arranged that no checking is required.

Jacket and Core-box Construction

The jacket was made first, its internal dimensions being determined by the thickness of the mould and core base-piece. The jacket is about 6 in. thick and is made to ingot-mould metal analysis. The bottom edge of the jacket was trued up and on it was placed a cast-iron plate. Then a core of concrete of the same thickness as the core base-piece was rammed up. After hardening, it was covered with paper to act as a parting and the rest of the jacket was rammed up in concrete carrying light reinforcements. The latter core was, after hardening, used as a pattern to make the pit of reinforced concrete. Thus, the contour of the pit sides aligned themselves with the shape of the jacket. The stool, which stands exactly central in the pit, is firmly anchored.

To make the core box, a model of the core was prepared in two halves in loam. Then the two halves were joined and the whole placed on a surface plate. Surrounded by steel plates, the interspace was filled in with reinforced concrete to produce two half core boxes. The end piece was cast about 2 in. wider and 1¼ in. deeper than necessary. The concrete stool prepared in the pit was placed in this recess and the remaining space was filled up with concrete. After this, both half core boxes were placed on the floor plate and adjusted with reference to the base-piece. Concrete core boxes were also made for the lug cores.

The Author expresses his thanks to the directors of the Werkspoor Company for permission to publish this Paper and to his colleagues (especially Mr. Achatz) for the assistance they have accorded him.

New Process of Painting Aluminium

A new process which overcomes the problems of painting aluminium effectively has been developed by Drynamels, Limited, a subsidiary of Tube Investments, Limited, in association with TI Aluminium, Limited. The process introduces a new primer containing acid ingredients, special resins, and a corrosion-resisting pigment. It etches the metal surface, thus establishing a close adhesion. It also provides a corrosion-proof coating. The new primer can be applied by brush, sprays or roller coating. Dry in 15 minutes, it eliminates the need of pre-treatment equipment, and is particularly useful for large aluminium structures unsuitable for other pre-treatment processes. It can be applied to a wide range of other metals and alloys.

Nicholls for having treated the subject in so clear and comprehensive a manner.

MR. NICHOLLS briefly acknowledged the thanks of the meeting, and in doing so said he was pleased that his lecture had been so well received. In preparing it he had not attempted to be spectacular, but simply to give a survey of the practice in the foundry with which he was connected, the object of which was to produce sound castings economically.

Notes from the Branches

Wales and Monmouth

On November 5, Mr. G. W. Nicholls, of Bradford, presented a Paper entitled "Production of Medium and Heavy Iron Castings" to the Wales and Monmouth Branch of the Institute of British Foundrymen at Cardiff.

Illustrated with a series of slides, the lecture covered the production of medium and heavy castings for the machine-tool trade. The fact that the Paper had already been published did not detract from the attention of the audience, who followed the speaker with interest for nearly two hours. Mr. Gordon Jones congratulated Mr. Nicholls upon his Paper, covering as it did every detail from design to finished casting. He asked what formula was used to determine the area of downgates and the rate of pouring.

MR. NICHOLLS replied that they had no fixed formula to work to, except to see that the casting was run as quickly and as quietly as possible and that there was adequate choke-back from the ingates to the pouring bush. The casting in question required 31 tons of metal, which the aim would be to pour in 2½ to 3 minutes. One set of downgates was considered sufficient for a casting 9 ft. long; above that, pouring would be effected from both ends simultaneously. Total cross-sectional area of downgates, including auxiliary runners, would be approximately 22 sq. in.

MR. G. COLLINS inquired as to the method of calculating the camber of the bed upon which the pattern was rammed.

Replying, MR. NICHOLLS stated that experience was the best guide. Variations in design and section of casting required consideration. Records of practice were kept so that any repeat order could be produced upon same lines as previous successful operations.

MR. KINSMAN asked what effect pouring temperature had upon the process of casting.

The AUTHOR replied that care was necessary in relation to the section of a casting. Cold shuts or mis-runs were to be avoided on one hand, and too high a temperature with considerable graphite separation in the course of cooling, on the other. The casting in question was run at approximately 1,230 to 1,250 deg. C.

Proposing a vote of thanks to the lecturer, MR. AMOS said it had been a most interesting and instructive Paper, particularly to a jobbing moulder. He was sure everyone present had enjoyed listening and at the same time had gained quite a few tips on methods of moulding the heavy castings illustrated. He thanked Mr. Nicholls for his lengthy and detailed presentation of his subject.

MR. G. COLLINS, seconding, also expressed his appreciation of the lecture. As he was engaged in supplying castings to the machine-tool trade, he was aware of the high standard of quality required. He was very pleased to second this vote of thanks to Mr.

(*Continued at foot of previous column*)

British Steel Founders' Association

Productivity Convention at Ashorne Hill

The productivity convention, held last month, has previously only been commented upon editorially in the JOURNAL. *The following summary of the proceedings has now been released.*

Session No. 1—Steel Melting Practice

Mr. R. Lamb, the chairman of this session, which was based on a Paper by Mr. A. C. Brearley, summed up its work as follows:—

The discussion of the application of high-speed melting operations in British foundries with particular reference to the electric-arc acid process, was broadly covered by five main aspects.

Availability of Scrap

The acid process demands that the scrap used shall be as low in sulphur and phosphorus content as possible, preferably below 0.04 per cent. each, and fears were expressed that this type of scrap might not be available in the quantity or type necessary. Similarly, contamination by other undesirable elements was considered to be a further objection to raw materials available. This view emphasised the advantages of basic melting processes, for with these methods impurity of scrap is not as serious a drawback. It was considered, however, that it might be possible to make arrangements within the steel industry for better types of scrap to become available. A further point discussed was the importance of proper separation of scrap arisings within foundries and the difficulties attendant thereon.

Power Supply

The adoption of acid arc-melting practice in the place of side-blown converter or even basic electric would heavily increase demands upon the electricity-supply authorities, particularly as regards peak loads, especially as highly-rated transformers would be necessary. The general position of supply of current, for new applications, particularly in winter time, would be likely to be difficult for at least two years, and it was felt that some approach to the electricity authorities on the lines of a questionnaire might help to clarify the position, especially as regards the charges for heavy loads. There was a general feeling that electric-furnace users might be placed in a disadvantageous position with regard to power rates.

Process and Layout

Any high-speed melting operation would make it essential that the absorptive capacity of a foundry should be correspondingly increased, which would involve some standardisation of product which might extend through the foundry industry. A point was made that, in the industry, melting capacity was generally in excess of floor capacity and speeding-up would aggravate the position. It was emphasised that the scope of operation in this country was nothing like as great as in the U.S.A., so that re-orientation in the industry would not be so readily possible. The discussion also dealt with the use of oxygen, the use of high-speed methods of making analyses, furnace control, and the safety of the operatives.

Quality of the Product

There was considerable discussion of the American policy of giving a customer the quality required without the large margin which is more usual for manufacturers in this country. It was felt that to de-grade the quality of product to the minimum level in order to obtain the maximum productivity should be approached with very great caution. It has been customary to think of quality in the terms of that produced by the basic arc-process, and a suggestion was made that the latter could be speeded up by some reduction of refining times as well as by increase in melting efficiency. On the other hand, acid arc carbon-steel was not inferior to that of the side-blown converter, so that there was no objection to the former on the grounds of general quality. A point was made that the industry might adopt the American idea of having an experimental section in its foundries to deal with development of ideas to improve quality and yield of product.

Working Conditions

The subject of productivity in regard to human relations, administrative control, etc., was discussed in some detail, and the points stressed were, (*a*) that there should be more personal contact between managers and workmen, (*b*) that melters should be assured that the additional steel made by higher-speed melting can be satisfactorily absorbed, (*c*) that there should be greater incentives for higher rates of production, (*d*) that there should be better training of foremen, *i.e.*, they should be leaders as well as supervisors. It was agreed unanimously that noone wished fear of unemployment to be introduced into the industry, and that all efforts should be made to improve relations between the administrative side and workmen so that maximum co-operation could be ensured.

Session No. 2—Feeding and Gating

The basis of the second session was a Paper by Mr. E. Daybell. Dr. Dadswell presided, and his summing up is contained in the statement which follows.

At the commencement, Mr. Daybell drew attention to the fact that much of the technique used in America was based on fundamentals originally learned in the steel foundries of this country and taken to the United States by skilled craftsmen who had sought their livelihood in American steel foundries.

Whilst the subject matter of the Paper consisted of a review of many special applications used in the making of steel castings in the United States, Mr. Daybell drew attention at the outset to the objects of feeding and gating, with particular reference to the importance of their correct application when work is started at the moulding stage, with a view to increasing productivity at the subsequent stages in finishing the castings, as for example the saving of fettling time by the ease of removal of feeders and gates, the retention of the shape of the casting, and its freedom from defects and adherence to limits of size.

From the technical aspect, the review made by Mr. Daybell was of absorbing interest to all those taking part in the conference, because of some of the ingenious applications of feeding heads and running gates. Mention was made of atmospheric heads and developments to ensure their efficiency; or the placing of additional ingates to promote directional soldification; or enlarged runners in juxtaposition to a wall of the casting to prevent freezing of thin sections by a form of remote heating. Mention was made of a development in the use of a proprietary brand of exothermic material, known as " Risotherm," which is applied to a feeder head in order to provide steel to replenish it at some stage after pouring.

Another section of the Paper, of considerable interest to the members present, was that referring to Williams heads and Washburn, or knock-off, cores. Some reference was also made to the use of internal and external chills, which was, in general, very similar to British practice. Mr. Daybell's Paper was enhanced by the exhibition of a number of slides illustrating his remarks.

Before the members separated into discussion groups, the chairman drew attention to the fact that much could be learned from the Paper because, whilst much of it was neither fundamentally new nor new in application, generally speaking many of the methods were not widely practised in Great Britain. Sometimes the methods had been tried, but because they failed the first or second time, they had been abandoned. He thought that the activities of the new B.S.F.A. research and development division would contribute to a more rapid propagation of the best ideas throughout the industry. It was necessary for the industry to increase production of castings and to maintain the best quality because of competition from other types of material and forms of construction.

On reassembly after the delegates had retired for discussion in groups, the spokesmen for each of the groups brought forward a series of questions and comments. Whilst some of these were on the detailed technical aspect of the actual processes reported on, and were of general interest and value to the members present, the more important discussion revolved round matters of principle. Some of these were:— Did individual costing of orders retard expenditure on experimental work? Was there enough interchange of ideas between foundries in this country, as apparently there was in America? Was attention being paid to making castings too sound in many cases for the jobs which they had to do, bearing in mind that radiography enabled one to find unsoundness and to make sure that it was not harmful? Was there anything new in the methods put forward, or were they not all previously known in this country? Was there too much faith placed in bottom pouring from ladles, and could not the continental practice of lip pouring be reverted to with advantage? Was it realised that some of the methods proposed increase the weight of liquid steel used and the moulding cost? Is there enough collaboration between the foundryman and designer? Are patterns made by customers sufficiently good to allow steel founders to make satisfactory castings? Was the analysis of the proprietary mixture, Risotherm, known and could it be obtained in this country? Could it be that, whilst many of the methods developed in America were known (technicians visiting that country having drawn attention to them on their return to Britain), the methods were not applied because shop routine called for a pattern already existing to be used urgently in its present condition in order to meet a customer's delivery? Was it a fact that process or methods planning before the launching of a job in the foundry was not sufficiently developed throughout the country's steel foundries? Was it not necessary to train still more young foundry technicians, who would contribute to development within foundries?

Function of the New Research Section

After these questions had been dealt with in detail by Mr. Daybell, and by discussion between the members, the chairman, in summarising the discussion, said that whilst it was agreed that the technical information was known in this country, it was also agreed that it had not been used in such a widespread manner as in the States, and it was acknowledged that some of the methods, particularly the Williams head and the Washburn core, had had their origin in the United States. It was considered that those responsible for the administration of foundries were not deliberately curtailing expenditure on experimental and development work, but that it was not proceeding fast enough, partly due to inadequacy of industrial research, which would now be corrected by the new research division of the B.S.F.A. It was also felt that the need for logical planning and processing and for the training of young technicians was of great importance. It was claimed that, as the productivity team's report was based on a cross-section of American foundries, so, if a cross-section was taken of British foundries (many of an up-to-date nature comparable with those in America), after allowing for the type of orders received, this would be favourable, and in fact visitors from the continent and from the United States since the war had expressed admiration for what they had seen. There were in actual fact several foundries whose technique and plant were based on association with those in America. It was repeated that one of the objectives of the research division of the B.S.F.A. would be to encourage widespread adoption of the best ideas which may now be practised by the few.

Whilst one often heard that the engineer designer should collaborate more with the steel founder, the

British Steelfounders' Association

chairman considered that this was entirely in the hands of the steel founder. *He had always found that an approach to the engineer consumer for modifying the design of a casting was favourably considered.* The B.S.F.A. had publicised, by distribution of their bulletins to engineers, certain fundamental points of design which help in the making of castings, but there was always the detail which might need modification after review from the foundry angle, and again this was where process or methods planning formed a link between the foundry floor and the consumer. It was concluded that the steel-foundry industry in this country had nothing to be ashamed of in view of the advance made in the last twenty years, but that the enthusiasm with which the productivity team returned from America should remain infectious, and the drive and energy for efficiency and productivity be maintained by all those engaged in the industry, whether working on the shop floor, responsible for technique, or administration.

Session No. 3—Sand Practice

The chairman was Dr. J. R. Rait, and in this case the Paper was by Mr. J. Jackson. The chairman's summing-up is set out in what follows:—

The session concentrated attention, both in the Paper and discussion, on the bearing of sand practice on productivity in the steel foundry. It was generally agreed that the fettling shop is the bottleneck in the production of castings in this country, and that an improvement in sand practice would materially help productivity by reducing the amount of fettling required. There was unanimity of opinion that green-sand casting should be more widely used, and that there is a distinct possibility that larger castings could be produced by this method. The Americans, it appeared, use finer-grained sands and probably better equipment. One founder stated that his firm had adopted the American green-sand practice and, without specialised equipment, had not only been successful in producing first-class castings, but had substantially increased output. An increase in the use of green-sand practice must, therefore, be given serious consideration. In the same way it also appeared that wider use of the skin-drying technique would materially assist productivity and should also be given further attention.

It was evident that in American steel foundries there is a marked tendency to develop special sand mixtures for particular applications. This would appear to be a somewhat retrograde step. It was known that in this country different sand mixtures are frequently used by different foundries for producing the same casting, and the chairman expressed the view that standardisation of sand mixtures within each organisation should be attempted wherever possible, thereby easing the problem of the storage of raw materials and simplifying not only the control of incoming raw materials, but also the preparation of sand mixtures for use in the foundry. It was essential that, once a satisfactory mixture had been developed, the properties of the material should be consistent and under close control to ensure uniform results. The ease with which a sand mixture is milled and prepared has an obviously important bearing on productivity, and synthetic green-sand mixtures used in American practice were to be commended in this connection. In the same way, the milling properties of other sand mixtures should always be borne in mind.

Considerable discussion ranged around the wide use of silica flour, both as an ingredient in dry sand and for mould paint, in American practice. It was appreciated that the health of the worker has an important bearing on productivity and, in this connection, it appeared that this American practice results in a considerable decrease in the amount of fettling required and that, as a result, instead of increasing the health hazard, flour has, in point of fact, the contrary effect. It was very dangerous to state glibly that we have found suitable alternatives for silica flour—there was still considerable controversy on this matter; it appeared to be agreed that there is no substitute for silica flour as an addition to moulding materials. However, there are siliceous clays in this country which consist of a natural silica flour bonded with clay, and this clay-bonded material can be incorporated in sand mixtures to give the same result as the separate silica flour and clay. In this way the dust hazard can largely be eliminated in preparing dry-sand mixtures. More confidence appeared to be held in the elimination of silica flour, from mould paints. Since the mould paints can have a major influence on the degree of the burning-on, scabbing, etc., they have a marked effect on fettling and, therefore, on productivity. There is no doubt that an intensive investigation into mould paints is urgently required, and co-operative work would be extremely valuable. It should, however, be remember that most of the alternatives such as zircon, andalusite, sillimanite, etc., are imported from abroad, and that the only suitable material occurring in this country is silica flour. These imported materials are not only more expensive, but may not be available in the event of emergencies. The steel-foundry industry can probably learn a great deal about foundry paints from a study of the lost-wax precision-casting process. It was indicated in the Paper that vitreous enamels might be worthy of consideration in this connection.

Among many important points raised during the discussion was the successful use of special chamottes for moulds for heavy castings. It appears that the Americans are making such moulds with naturally-bonded sands, but it is doubtful whether such sands are available in this country. The compo type of moulds for heavy castings should not be lightly dismissed because excellent heavy castings have been produced in the Sheffield area in this material, and Fischer's of Schaffhausen have also developed a very satisfactory practice with chamotte. It should also be borne in mind that the old-fashioned steel-moulders' compo is difficult to ram and therefore slows down productivity, whereas modified compositions of chamotte can be

developed which are readily mouldable. It is very important that there are ample supplies of calcined fireclay (chamotte) available in this country, and that the use of such mixtures for the heavier castings would eliminate the silicosis risk. More consideration should therefore be given to the wider use of such special chamottes.

The session also brought forth agreement that sand reclamation has not been sufficiently developed in this country. The advantages of this practice are obvious so far as productivity is concerned, and sand reclamation to provide the optimum efficiency requires more consideration. It is also gratifying to note that the practical steel founders of this country believe that more scientific control of their raw materials and ultimate mould mixtures is essential. It has been stressed, however, that not only should there be laboratory control, but also very close co-operation between the laboratory and the foundry floor. Mention was also made of alternative methods of drying and baking cores and moulds. Dielectric heating of cores in special cases would, it was felt, undoubtedly increase productivity.

Session No. 4—Mechanical Aids

Following a Paper by Mr. W. L. Hardy, Mr. R. F. Ottignon, the chairman, gave the following summary of the conclusions.

This session started by accepting the team's report that, on average, British steel foundries have to reduce their man-hours per ton by 30 per cent. before their production efficiency can begin to compare with that of America. It was agreed that this must be done, and that the prices of steel castings must be reduced accordingly, to assist users of steel castings in selling their finished products abroad and maintaining a high level of activity and employment. As Mr. Hardy's Paper was listened to with this point very much in mind, it was the more surprising to hear him repeatedly stress that it was not the equipment which the Americans have, but the way in which they use it, which puts them ahead of us.

Amongst the mechanical aids in universal use in the States, Mr. Hardy stresses Sandslingers, coreblowers and pneumatic rammers. When those production executives who had installed any of these aids in their own foundries were asked to stand up, representatives from most of the foundries present got to their feet—33 in all. When all those who through opposition and restrictive practice of one sort or another had been unable to get a satisfactory use made of the equipment were asked to sit down, only three remained standing. The points made in the discussions have particular significance if this situation is borne in mind.

The ten discussion groups were asked to consider what increase in output per man-hour could be obtained in the near future either with or without additional mechanical aids. One group expressed no conclusion, but in the opinion of the remaining nine groups anything from 10 to 30 per cent., with an average of 20 per cent., was considered to be quickly obtainable if there was a change of attitude and full use was made of casting equipment. They also stated that a further improvement would then be obtainable by increasing the mechanical aids, although some groups did not recommend increasing mechanisation until better use was made of existing plant.

The mechanical aids most generally recommended as worth more consideration by all concerned are:—Sandslingers; core blowers; pneumatic rammers; localised lifting appliances; sand-handling equipment, and better pneumatic hammers and grinders for fettling-shop use.

A general desire was evident for a higher standard of preventative maintenance than at present exists in most foundries. In this connection, the slide shown by Mr. Kain giving details of Lake & Elliot's system of routine maintenance is worthy of special consideration. The strength of foundry plant was criticised, and it was considered by several groups that foundry plant in general needed to be more robust than it is in many cases at present.

There was a general belief that opposition to mechanisation still springs largely from a fear of unemployment; how this fear can best be overcome is a matter worthy of early attention from the Government, from the leaders of the industry, and, most important, from the trade-union leaders.

Session No. 5—Working Conditions, Incentives, and Methods of Payment

The Paper provided as a basis for discussion was by Mr. B. Travis, the President of the Sheffield Branch of the Amalgamated Union of Foundry Workers. Mr. F. W. Rowe presided, and his summing-up is given below.

The session proved to be the most lively of the conference. Mr. Travis brought our fairly and squarely the differences he and other members of the team observed in working conditions, methods of payment, and incentives in the States. The main discussion raised many highly-debatable points which will have to be settled before the highest productivity in the industry will be attained. There was general agreement that, although much had been done to improve lighting, heating, ventilation, tidiness, cleanliness, layout, and washing accommodation in steel foundries since the war, much still remained to be done before the standard desired to secure maximum recruitment and maximum worker satisfaction was obtained. The present complicated method of wage calculation was deplored by shop stewards, supervisors, and management alike, and strong pleas were put in for simplification.

On incentives, there was fairly universal agreement, both by shop stewards and management, that the present high taxation on workers' earnings (particularly bonus and overtime earnings, together with lack of consumer goods in the shops, had an important detrimental effect on high endeavour. On methods of payment, stress was laid on the desirability of time and motion study as the only satisfactory way of determining fair piecework prices and

British Steelfounders' Association

mention was made of the need for individual piecework schemes wherever possible. It was obvious, however, that much educational work for all levels throughout the industry was needed before universal acceptance of these principles would be secured.

Practically every speaker had something to say on restrictive practices. These are traditional and of long standing, and it was obvious their removal would not be easy. They had been instituted in former years in the hope of safeguarding the skilled worker from unemployment and of preventing the utilisation of cheaper labour on processes regarded as the province of skilled men. That they had the effect of preventing maximum output there appeared to be little doubt, but all groups represented appreciated that they would not be removed unless a spirit of the fullest confidence was engendered between management and shop-floor workers. It was agreed that alteration in attitude of all groups was needed before this could come about, but agreed, also, that this was necessary if man-hours per ton were to be lowered and the future of the industry assured. Much mention was made of the need for improvement in human relationships with effort by all concerned to obtain this, and with management taking the lead. Finally, there was much complaint that insufficient time had been devoted to this particular session. The subjects discussed were regarded by all as being fundamental to higher productivity.

Session No. 6—Administrative Control

The chairman was T. H. Summerson, J.P., and Mr. D. H. Aston provided the Paper. The chairman's summing up is contained in the following statement.

The Paper began by outlining the organisation in a number of American steel foundries, but this did not differ to any material extent (apart from the differences in nomenclature) from normal arrangements in this country. Also described in considerable detail were different costing systems in use in American steel foundries. From the angle of productivity, however, it is unimportant whether the details of the competent systems of cost ascertainment and control which are operated in the U.S.A. differ from current practice in the British steel-foundry industry, particularly since, broadly speaking, the Paper revealed nothing which was not already known to industry in this country. What is important is that some British steel founders should be reminded that without an efficient system of cost ascertainment they cannot know what their costs are, and that without a proper system of cost control they will go into battle to improve their productivity with only half a weapon instead of a whole one.

So far as cost ascertainment is concerned, British steel founders, like the Americans, suffer from the competition of those whose selling prices are based only on "guestimates." From the control angle it is felt that many British steel founders can learn a lesson from the system of budgetary control of costs which was outlined in the Paper, as they can also profit from the principles of cost normalisation recommended by the Steel Founders' Society of America. Steel founders, as an industry, are determined to tackle this question of productivity in a wholehearted way, and there must be standards against which to check progress. Man-hours per ton may not be ideal, but it is a simple and workable criterion which, it is thought, will be adequate for the purpose. An American steel foundry quoted a figure, whatever the castings they were making, of 80 man-hours per ton, this gives some idea of the target and of how difficult is will be to attain it.

As regards incentives, the Paper mentioned the following points:—The almost universal use of time-study; the periodical audits of times or of piecework prices; the fact that most firms give day-to-day information to a worker of his earnings, and the penalties which are imposed for faulty workmanship. The Paper also outlined the monetary incentives which some American companies offered to their supervisory grades; these may repay study by British firms.

Under the heading of "Selling," the Paper referred to the anti-trust laws in America, and also to the apparently-inconsistent issue by the Steel Founders' Society of America of a price-range report which, however, seems to be a matter for information and guidance only. The Paper also mentioned the part which the Steel Founders' Society of America has played in encouraging greater standardisation of steel castings, by the use which is made of reduced prices for increasing quantities. The convention noted that "selling involves teaching the customer to accept speciality articles from which he will benefit from the resultant high productivity in the form of reduced selling prices." It is apparent that there is a reward to be gained by both the steel founder and his customer from increased repetitiveness and standardisation; and although the B.S.F.A. has already accepted the principle of reduced prices for increased quantities, there is clearly room for much greater application of it.

The Paper recorded that American sales literature is generally of a high quality, that "Sales" is generally regarded as a top-level function, being usually under the control of a vice-president (or deputy managing director), and that the employment of salesmen, their stimulation, and company liaison with them, form a cardinal feature of the American steel foundries' selling policy. Some firms maintain considerable statistics of sales, analysing them from month to month by customer, by product and by salesman. Figures are recorded to reveal the profitableness or otherwise of each class of casting sold, and the sales analysis even includes statistics of scrap by class of work.

Conclusions

The whole work of the conference was summed up by Mr. F. A. Martin, O.B.E., chairman of the B.S.F.A., leader of the Productivity Team, in the following terms:—

This has been a meeting, not of employers and workpeople, but of representatives, from almost every

level, being employees of the companies who are members of the B.S.F.A. The convention has accepted as a basic principle that higher productivity is an essential, if the industry and the employment it provides are to survive. It has been apparent that, to increase productivity, there needs to be some acceptance of the American attitude towards productivity, as described in the report of the steel-founding team. This entails stern elimination of all inefficiency, and fair sharing of the benefits which high productivity brings—increased purchasing power and well-earned security.

In the unanimity which has been found in discussions among individuals of widely different training and outlook lies the promise that from this convention there will go out, to the forty companies represented, a body of one hundred and twenty-five men as keenly devoted to the cause of higher productivity as the sixteen members of the productivity team on their return from the U.S.A. The convention has called for greater freedom of interchange of information. Three specific means are visualised:—A productivity team to tour a number of British steel foundries; a second productivity conference to report progress, and regional productivity councils within the B.S.F.A. Arrangements will be made to call a second convention in the spring of 1950.

Changed outlook brings in its path new methods and machines and requires their ready acceptance. Resistance to desirable changes must be overcome, whether it arises from outworn habits or sheer stupidity. Pioneers, such as we now become, have need of large reserves of courage. All that has been said on the subjects of personal relationships, amenities, moral responsibility and even provision of fair and reasonable incentive payments can be reduced to the need for developing mutual respect among all steel-founding workers. Fear is inseparable from this mortal life, but mutual respect removes the fear of what one employer in authority can do to another, leaving both free to unite in conquering the fear of danger which threatens from without—of inexorable economic laws—and gives rein to healthy ambition.

It has been agreed that early improvements in productivity of 10 to 25 per cent. are possible, in the spirit expressed by the conference. That is now a challenge, to be taken up by every steel founder. Admittedly, man-hours-per-ton ratios are imperfect measuring sticks, but there is no other simple method. Means of comparing man-hours-per-ton ratios among the member companies of the B.S.F.A. will be provided within a short time. The conference has recognised, implicitly, the need for leadership of high quality, in trade union, trade association and employers' organisation, as well as in every company and workshop. Ineffective leaders, unable to inspire and fearful to risk their reputations for the sake of principle ought to give way to the real leaders.

Many suggestions with specific applications were brought out in group and general discussion. The larger aspects of the conclusions reached are embodied in the following resolutions unanimously adopted by those present at the final session.

(*a*) That the B.S.F.A. should take steps to secure adequate supplies of acid-melting scrap for the steel founders, to enable this economical melting method to be much more widely adopted.

(*b*) That the B.S.F.A. should take action to obtain recognition of the priority power requirements of the steel-founding industry and amelioration of the inefficiencies of working which arise from load-shedding and staggered working hours when applied to steel-foundry power requirements.

(*c*) The Executive Council of the B.S.F.A. are requested to use every endeavour to obtain revision of the present penalising power demand so that highly-rated electrical equipment may be economically employed.

(*d*) The suggestion is endorsed that a team somewhat like the first productivity team, might, with advantage to the industry, tour steel foundries in Britain to report in like manner.

(*e*) It is recommended that periodic productivity convention should be organised by the B.S.F.A. to encourage interchange of experience and ideas relating to productivity, and to report progress.

(*f*) The convention appeals to the Engineering and Allied Employers' Federation to take urgent action to simplify the present wage structure and methods of calculating wages in the steel-founding industry.

(*g*) The principle is accepted that co-operation among all those employed in the steel-founding industry can only be achieved upon a basis of mutual respect, and that in that spirit the obstacles to high productivity can be overcome.

(*h*) This conference takes note of the productivity team report on steel founding, accepts the principles and general recommendations set forth therein, and commends them to all who win their livelihood in the steel-founding industry.

(*i*) WE, the delegates to this conference, representing all levels of workers in the steel-founding industry, each and severally pledge ourselves, unreservedly, without fear or favour, to constant endeavour to increase the productivity of our industry.

OVER 60 REPRESENTATIVES of directors, staff and other workers of Peglers, Limited, brass founders, Belmont Works, Doncaster, attended the firm's jubilee celebration dinner, with representatives of the Town Council and local organisations, at Punch's Hotel, Doncaster, on December 2. Mr. A. Ellis, J.P., chairman of directors, presided over the gathering. One of the toasts proposed was that of Mr. Fred Birchall, joint founder of the firm, who is now nearly 80 years old. With his brother, Andrew, Mr. Birchall started the business in a small two-storey workshop 50 years ago, and the present chairman of directors joined as a clerk in 1904.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

FOUNDRY DRESSING SHOPS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—As an Australian foundryman visiting this country, I have formed the impression, from conversations with British foundry executives, that dressing of castings, and dressing shops generally, are one of your major "headaches." If that is so, I thought your readers may be interested to know how this problem has been tackled in Australia by some of the leading iron and steel foundries. I do not wish to suggest that our foundries are any model in this respect, as, unfortunately, far too many of our dressing shops are still the traditional dark, dirty "up one end of the shop" variety, but, in several plants, notable progress has been made in the last few years. I think most of us know the type of dressing shop we could design, if we were able to start afresh; the problem is usually that of modernising an existing plant without seriously interrupting output. In the foundries I have in mind—jobbing steel foundries—the attack has been along three separate lines:—

(1) *To Reduce the Necessity of Dressing.*—This can be achieved by determined sand control and, as far as practicable, standardising pouring temperatures, together with design of gates and risers which fulfill their proper function, but are easily removed. The "knock-off" risers using "Washburn" cores are ideal where applicable. In larger castings, requiring internal core reinforcements of some magnitude, many wearisome man-hours can be saved by designing the core-irons to facilitate dressing—a very obvious but often disregarded precaution.

(2) *Re-designing the Dressing Shop.*—This is no light problem, and great determination and very careful analyses of the situation are the first essentials. In all too many foundries there is a huge heap of unfettled castings representing many weeks or months moulding output, and, perhaps, thousands of pounds of sterile assets. The specific points which cause a "bottleneck" vary in different shops, but it is often found that pneumatic-chisel dressing and shot-blasting are inadequate. In some cases, excessive handling due to layout absorbs much essential labour.

In each of two Australian foundries a new layout to give linear flow was prepared, the dressing shop floor was concreted in stages, such plant as stationary grinders and swing grinders was moved to new positions and fitted with dust collectors. Then, all columns, walls and plant were painted, creams and greens being used, lighting was improved, and new benches, racks and bins were installed. An elderly employee was engaged full time for sweeping the floors and cleaning around benches; this, in addition to the removal of burnt sand, scrap, etc. With the "new look" the shop very soon cleared a large back-log—known as "Mount Misery"—and the section has kept pace with moulding ever since.

(3) *Recruitment.*—The third line of attack concerns the difficulty of attracting suitable young men into dressing shops. This has not been solved, but progress has been made. In a clean, well-lit, brightly-painted plant the employee can be persuaded that he is not a "foundry-hand," but a "process-worker." He can be termed a "power-grinder" or "pneumatic-tool operator"; whilst this may be thought rather trivial, the fact remains that many young men are reluctant to enter a dressing shop as such, but if they can be made to think of it as a metal-processing plant they feel they are in a higher social and technical strata, almost on a par with the machine shop.—Yours, etc.,

J. A. PRESTON.

38, Fellows Road, London, N.W.3.
December 9, 1949.

EFFECT OF GRAIN SHAPE ON THE BEHAVIOUR OF SYNTHETIC CORE AND MOULDING SANDS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I would draw your attention to the article printed in your issue of September 22, 1949, pp. 359 *et seq.*, and especially to page 365, starting at the subheading "Moulding Properties of Angular and Round Sands." Here two sands are described (N and F) as having similar grading and almost identical specific surface per gm.

If I have correctly interpreted the subject matter of the article, the coefficient of angularity is determined solely by grading and specific surface, and (if this be so) the two sands referred to would be expected to have very similar angularity coefficients. They are, however, reported as having coefficients of 1.08 and 1.20, which, according to my interpretation, is not compatible with the fundamental data. Would it be possible to have this matter elucidated, if necessary, at the source?—Yours, etc.,

G. B. HESLOP.

Romford, Essex.
December 10, 1949.

SURFACE ROUGHNESS OF CASTINGS

From Professor Hugh O'Neill

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—In your editorial for the issue of November 10, you refer to Mr. Hobman's surface meter and classification as "a dream come true," but at the same time you express preference for reporting the results "by a simple number starting from one." I am afraid that I never saw your leading article of 1927, but in 1943 Mr. Insley and I published some work on this subject ("Metal Treatment," Autumn, 1943, p. 181). We abandoned, after trial, a meter which we made of somewhat similar type to that described above, and eventually produced a visual comparison scale. You will be interested to know that this started at number 1 and finished at 5, and the equivalents in micro-inches were listed.—Yours, etc.,

HUGH O'NEILL.

University College, Singleton Park, Swansea.
December 9, 1949.

What is Acicular Cast Iron?*

Theoretical Considerations and Production Details

By W. W. Braidwood

(*Concluded from page* 689.)

Heat-treatment

Acicular irons give marked and unique response to low-temperature treatment, particularly when the as-cast structure is over-alloyed. In such cases, initial

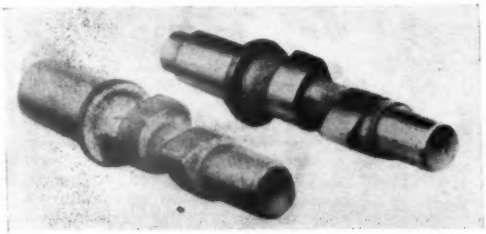

FIG. 22.—CAMSHAFTS FOR PETROL ENGINE.
[Courtesy Douglas (Kingswood), Limited.

hardness is greater than 320 Brinell and the iron may be difficult to machine. After tempering by holding in the range 300 to 350 deg. C. for at least six hours plus one extra hour for each inch of thickness, and cooling slowly, it will be found that, although the Brinell reading is unaltered or even slightly raised, machinability is greatly improved. Moreover, the tensile strength is also increased. For these reasons, the procedure of over-alloying and tempering is recommended when the highest tensile strength and/or the maximum machinable hardness is desired. However, since the impact value is somewhat impaired, this technique is undesirable when the main requirement is maximum resistance to shock. This is exhibited when the fully-acicular structure is produced as-cast.

Why are the properties altered in this way? Micro-examination reveals no change in the light-etching constituent, but the groundmass is modified, being caused to etch darkly. X-ray studies have shown that decomposition of martensite takes place, together with partial transformation of retained austenite. It is probable, therefore, that strengthening is due to a combination of three effects:—Decomposition of the martensite present; partial decomposition of the retained austenite, and relief of internal stress. An improvement in machinability without reduction in hardness is probably the result of replacement of the original hard martensite and part of the austenite by tempered martensite. The reduction in impact value is no doubt due to the partial transformation of residual austenite. Normally, no heat-treatment of any other type is applied, although, in the case of heavy castings, some saving in alloys is possible if provision can be made for stripping the castings soon after pouring, hastening cooling through the high temperature range, and then holding at 450 deg. C. for a sufficiently long time before cooling slowly to room temperature. In practice, however, the economy in alloys is usually more than neutralised by the cost of this treatment.

Test-bars

It should be made clear that the B.S. casting test-bar relationships are not reliable in the case of acicular irons. These relationships were based mainly on considerations of graphite formation at around solidification temperature, and on transformation taking place at about 700 deg. C. The rate of cooling depends primarily on the ratio of surface area to volume. Rote and Wood[12] have calculated that in a 1.2-in. dia. bar of infinite length this ratio is 3.33 sq. in. per cub. in., and that the same ratio would apply to an 0.6-in. thick flat plate of infinite length and breadth. According to B.S. specification the 1.2-in. dia. bar represents castings ¾ to 1¼ in. thick, and the British standard casting test-bar relationships may be inaccurate even for pearlitic irons.

When producing acicular iron, it is important to ensure that one is not misled by use of an unsuitable test-bar. The best test-piece is an extension of the ruling, or

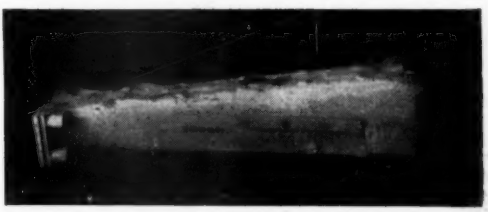

FIG. 23.—SIDE STANDARD FOR STEAM DROP HAMMER. WEIGHT 3½ TONS. TENSILE STRENGTH IN 4-IN. SECTION—27½ TONS PER SQ. IN.
[Courtesy Sheepbridge Stokes Centrifugal Castings Company, Limited.

most important, section of the casting. When use must be made of a separate bar, it should be of such diameter and length as to give approximately the same surface area:volume ratio as obtains in the casting. In

*Paper read before several branches of the Institute of British Foundrymen. The Author is on the research and development staff of the Mond Nickel Company, Limited.

What is Acicular Cast Iron?

the case of production runs, the dimensions of the bar should be adjusted as required, to give identical structures in the bars and the castings. The necessary diameters will generally be found to be considerably greater than those quoted in B.S. 1452.

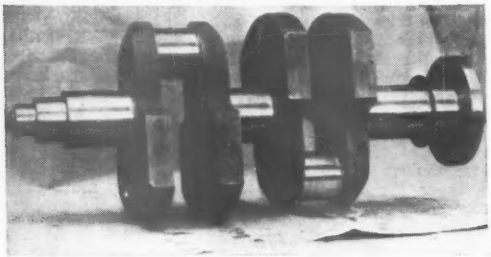

FIG. 24.—CRANKSHAFT FOR TWO-CYLINDER, 26-H.P., 1,000-R.P.M. DIESEL ENGINE.
[Courtesy of W. H. Dorman & Company, Limited.

Properties

The individual mechanical properties vary according to the type of structure produced, the heat-treatment applied, and the graphite form and content. In the as-cast, flake-graphite irons, tensile strength ranges from 25 to 35 tons per sq. in. and the effect of increased section is slight. By over-alloying and tempering, the strength can be raised to 40 tons per sq. in. and even higher.

The impact resistance of acicular iron is generally about twice that of pearlitic high-duty iron. In as-cast structures of the light-etching type it usually ranges from 30 to 45 ft.-lb. in the B.S. 1349 test. Both in over-alloyed and tempered castings it may be lower, but it is rarely less than 25 ft.-lb. Hardness is generally in the range 260 to 320 Brinell, and such irons are readily machinable. By over-alloying and tempering, machinable irons with even higher hardness can be produced.

The acicular irons show much greater resistance to wear than the pearlitic irons. This is due not only to the high initial hardness of the acicular structure, but also to its ability to work-harden by breakdown of residual austenite at the working surface. This characteristic can be of great practical value, as in the case of the camshaft shown in Fig. 22. This camshaft is used in the Douglas 540-c.c. petrol engine. At the outset of production the shaft was flame-hardened on the cams, before final grinding, but later, after bench tests had proved that work-hardening takes place in service, this operation was discontinued. Work-hardening is a satisfactory property in service, but it can give trouble in fine machining operations, such as milling and threading, and the drilling of long holes of small diameter. Where such difficulties are experienced, or anticipated, tempering treatment is helpful.

Short-time tests at elevated temperatures have shown that there is only slight reduction in the strength of acicular iron up to 400 deg. C., but that a rapid decline occurs with further increase in temperature.[18] From these findings it would seem that acicular irons should not be used for service above 400 deg. C. In fact, however, acicular irons have had outstanding success in applications such as dies used in hot forging processes. It has been reported[18] that the dies used for wartime production of 25-pounder shells gave service life four to 10 times that of pearlitic irons. One particular die gave a throughput of 62,000 forgings, compared with an average of 8,000 for dies in pearlitic irons.

Applications

Among other successful applications in the heavy engineering field, mention may be made of the side standards for steam drop-hammers, illustrated in Fig. 23. These weight up to 3½ tons each; they successfully replaced steel during the war years. Castings have particular advantages over forgings when applied to crankshafts. These advantages include:—(1) Production to close limits of size and form, thus saving much machining and waste of material; (2) coring of journals and crankpins, and (3) manufacture of complex shafts whole, so avoiding the use of the attached pieces often found to be necessary when forgings are employed.

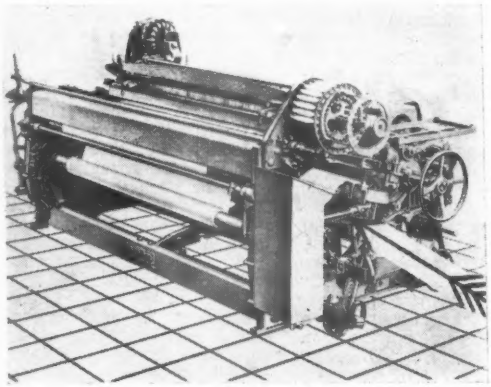

FIG. 25.—THE "PICANOL" AUTOMATIC LOOM.
[Courtesy Metiers Automatiques "Picanol," S.A., Ypres.

The wartime shortage of steel stimulated application of high-duty irons to crankshaft production, and the combination of strength, toughness, high machinable hardness and wear-resistance of acicular cast iron has made it particularly successful for this purpose. A complex shaft has already been depicted. Fig. 24 shows a shaft of simpler design, but equally high standard.

The manufacturers report that over the last three years they have put into service well over 3,000 shafts of various types in acicular iron.

The list of applications is very wide. The illustration of typical successes can be rounded off by a description of the products of Metiers Automatiques "Picanol," S.A., of Ypres, Belgium. The modern high-speed automatic loom is a fascinating machine to see in operation. The shuttle flashes from side to side at amazing speed, almost defeating the ability of the eye to note its passage, and cloth is produced in a continuous roll. A typical product of "Picanol" is shown in Fig. 25. The most important single movement in any loom is the "picking" motion, which propels the shuttle from side to side, and the parts which comprise this mechanism have to withstand very severe stresses. It is true to say that the motions of a loom are jerks, blows, oscillations, reciprocations and similar irregular actions. In the Picanol loom, the shuttle, which weighs about 1½ lb., changes speed from 30 m.p.h. in one direction to the same speed in the opposite direction more than 3 times per second. It is, therefore, of paramount importance that in the "picking" mechanism (indicated by arrow) only materials with excellent mechanical properties should be used.

The picking shaft, shown in the foreground in Fig. 26, is about 28 in. long by about 2 in. dia. It is stressed with particular suddenness and severity since it completes its movement. a part turn, in 7 thousandths of a second. These rapidly-repeated, heavy twists promote failure by fatigue and shock, and when the castings were made in unalloyed, high-strength iron of conventional type, with mechanical properties satisfying the requirements of B.S. 1452, Grade 23, failures in service were frequent. Since the adoption by Picanol nearly two years ago of nickel-molybdenum acicular cast iron* for the picking shaft and the shuttle hammer, breakage in service has ceased.

The production methods followed by Picanol are quite straightforward, though careful control is exercised at all stages. The castings are produced in their own foundry, the iron being cupola-melted to give the following composition:—Carbon, 3.0; silicon, 2.2 to 2.4; nickel, 1.8 to 2.0; and molybdenum, 0.8 to 1.0 per cent. The mechanical properties, determined on actual castings, are consistently in the following ranges:—Tensile strength, 25 to 30 tons per sq. in.; hardness, 280 to 300 Brinell; and impact (B.S. 1349), 37 to 45 ft.-lb. The two castings are moulded and poured horizontally, the metal being introduced, in each case, through an "off-feeder."

Outlook

Continued steady expansion in the use of acicular iron is probable. It may be argued that the new special-process iron containing spheroidal graphite and with strength in excess of that obtainable in conventional acicular iron, together with ductility which flake-graphite irons do not possess, will replace acicular iron for many purposes. Consideration must, of course, be given to the properties of the acicular matrix, such as its high machinable hardness and marked resistance to wear.

The most rational point of view is that the new developments are complementary, not competitive. Acicular irons can readily be produced with the improved form of graphite and the combination of acicular matrix with spheroidal graphite is likely to give the highest-grade iron of the future. The potentialities of this combination are still not fully explored.

The Author acknowledges his indebtedness to The Mond Nickel Company, Limited, for permission to publish this Paper.

*British Patent No. 545,102, Belgian Patent No. 467,794.

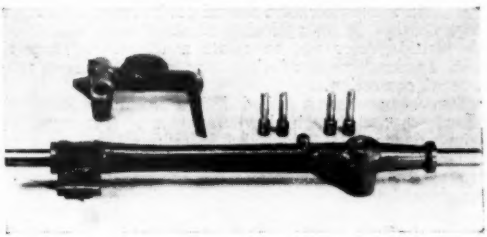

FIG. 26.—"PICKING SHAFT" AND SHUTTLE HAMMER OF THE "PICANOL" AUTOMATIC LOOM.
(Courtesy Metiers Automatiques "Picanol," S.A., Ypres.

DISCUSSION

When this Paper was presented to the London Branch of the Institute of British Foundrymen, the chairman, Mr. P. D. Pincott, introducing the lecturer, said that Mr. Braidwood was one of the many Scotsmen who had travelled south of the Border. He had written a number of Papers; his first, "Melting Practice in a Large Engineering Iron Foundry," read before the Scottish Branch in 1939, had earned the award of a Diploma of the Institute, and his subsequent Papers had maintained a high standard. Mr. Braidwood, in his position as development metallurgist with The Mond Nickel Company, Limited, travelled widely in this country and abroad and must have imparted much helpful information and advice to many people in the industry.

Opening the discussion, MR. P. D. PINCOTT said that when he thought of acicular irons his mind went back some years to recall his own experiments in 1940-41. He had experienced difficulties, mainly, high hardness and liquid shrinkage. Two things stood out in the lecture; it had been shown how the hardness was a function of the alloy content and could be controlled to maintain machinability, and that shrinkage was not great when the base composition was suitable, and there had been impressive evidence of the successful application of simple gates and feeders. Branch members would recollect the first Paper of the session, given by Mr. van der Ben and Mr. Haynes of The National Gas & Oil Engine Company. This described their foundry and its products,

What is Acicular Cast Iron?

and it would be remembered that many were in acicular cast iron. These had been shown to be made with great simplicity and success. He did not know to what extent acicular cast iron was being made in this country, but he felt sure that it was not as fully understood or as widely used as it deserved to be.

MR. CUTT asked what pouring temperature Mr. Braidwood recommended for acicular iron used for castings 1½-in. thick.

MR. BRAIDWOOD stated that he always hesitated to quote temperatures. If an immersion pyrometer were available, the temperature should not be lower than 1,300 deg. C., but if an optical pyrometer were relied on he would prefer not to quote a figure, as readings with an instrument of that type often required substantial correction.

MR. NICOL SMITH asked if the lecturer could explain why, although low-temperature treatment of acicular iron left Brinell hardness unaltered or even increased, machining was in fact easier?

MR. BRAIDWOOD quoted the explanation given in the Paper, which was phrased as follows:—

> ". . . . improvement in machinability, despite increase in hardness, is probably the result of replacement of the original hard martensite and part of the austenite by tempered martensite."

When the structure is difficult to machine the material is over-alloyed and there is martensite present together with the relatively-soft constituent, austenite. Martensite is very hard. Tempering treatment brings about two separate changes; the martensite becomes less hard but, at the same time, what was originally austenite transforms, at least partially, to give tempered martensite. In other words, the untreated structure has both soft and very hard constituents, the presence of the latter causing difficulty in machining. The treated structure has more uniform constituents of equal or even greater hardness but better machinability.

(The lecturer illustrated this point by reference again to slides earlier shown and to records and photomicrographs made available for inspection).

MR. A. R. PARKES said he would first like to congratulate Mr. Braidwood on an excellent Paper. He was sure that everyone who had done any experiments with acicular cast iron would agree that it was a masterly summing up.

He would like to ask about the history of acicular iron. He remembered that, in 1935, when he was associated with a firm making centrifugal castings, they produced a nickel/molybdenum iron and sent a sample to the British Cast Iron Research Association, which was described as "acicular." He regretted, however, that very little was done with it, although they did find that low-temperature heat-treatment produced phenomenal increase in strength.

He was surprised to find that Mr. Braidwood made no mention of aluminium. He had found that aluminium could also produce acicular structures in conjunction with molybdenum and he would like to know if Mr. Braidwood had experimented with it. His own experience had shown that the bad effects of aluminium, particularly its influence on the graphite form, somewhat negatived its beneficial action in producing the acicular structure.

Section Sensitivity

On the question of section sensitivity, could they cast a thinner section without getting martensite if they used some aluminium, and would the lecturer indicate the ranges of thickness that could be produced, all completely acicular? For example, if the composition were ideal for a casting of 2-in. section, what would a half-inch section be like, and what structure would be obtained in a five-inch section poured in the same iron?

A final point concerned heat treatment. He had carried out some experiments on air hardening in the case of some mould castings. The intention was to produce a fully-acicular structure "as-cast," but the alloying went astray and they finally obtained the correct structure by putting the castings in a furnace, heating them up for a time, then taking them out, placing them on the works trolley and running them round the yard in the open air. Was the air-hardening property used in commercial heat-treatment?

In reply, MR. BRAIDWOOD said that nickel-molybdenum cast irons had been made for many years and in some cases were found, inexplicably, to develop exceptional strength. Many people laid claims to having made acicular iron in the past. Probably they did, but did they know how or why they were producing acicular structures? The controlled production of acicular cast iron dated from the time of the systematic study of the subject by Flinn and Reese in 1941.

Much work had been done in searches for elements to substitute for molybdenum in the production of acicular iron, but none had been found to approach molybdenum in this rôle. He was interested in what Mr. Parkes had said about aluminium, but was obliged to express some disbelief. In any case he did not regard aluminium as a suitable element for alloying in appreciable proportions with cast iron.

Mr. Braidwood said that he had pointed out that one could not make hard and fast rules on the basis of section thickness. He had emphasised that the table quoted in the Paper should be regarded as a rough guide only. A 2-in. cube and a 2-in. thick plate had the same section thickness, but they would not cool at the same rate. In the case of castings of normal designs and average mass, however, it could be said that, if the composition were right for a two-inch thickness, it would be over-alloyed for a half-inch casting and the acicular structure would not be produced unless the casting were held for a long time in the intermediate range of temperature. On the other hand, if iron of the same composition were used to pour a casting five in. thick, the alloy content would be insufficient and the structure would contain pearlite unless rapid cooling through the pearlite transformation range was ensured.

He had been interested to hear the descriptions of the heat-treatment which, in a particular case, had been effective in producing the acicular structure. He did not feel that such a procedure could be recommended as normal production technique. The composition must have been under-alloyed and the treatment therefore would essentially be one of hastened cooling through the high-temperature range, to prevent formation of pearlite. This should preferably have been followed by holding at about 400 deg. C. It was important to emphasise that the most straightforward procedure aimed at production of the acicular structure on cooling in the mould and that heat-treament was not essential.

MR. B. LEVY asked if acicular cast iron could be produced in a foundry which did not have metallurgical control? Furthermore, in view of the high percentage of steel scrap which Mr. Braidwood had mentioned, would it not be more accurately described as semi-steel?

MR. BRAIDWOOD said that acicular iron probably could be made in some foundries which did not have a high standard of metallurgical control, but in this country and abroad production was in licensed foundries which had satisfactory facilities and equipment.

He had quoted the range 30 to 60 per cent. for steel scrap in the cupola charge. His own preference was for something between 35 and 40 per cent., and he suggested that nowadays that could not be considered to be a really high proportion. The term "semi-steel" dated from the old days when it was thought by some people that if half the charge consisted of steel the product was something midway between cast iron and steel. This, of course, was not so, and the term was meaningless.

DR. CHUBB referred to the possible use of aluminium and said he thought the lecturer had rather misunderstood the meaning of a previous speaker's remarks. Mr. Parkes had not referred to the possibility that aluminium might supplant molybdenum, but that it might replace nickel. The reason for this was that the production of acicular cast iron, as shown by the lecturer's very capable exposition, depended fundamentally and from the scientific point of view upon the control of two basic and opposing tendencies. One was derived from a carbide-forming element, molybdenum having been referred to particularly as such, and the other tendency came from an element which was essentially present in solid solution and which might exert a graphitising influence, if present in sufficient amounts. The one thus acted against the other, and the properties required could then be conveniently controlled by balancing the nickel against the carbide-former. That being so, it should be possible for other elements, in association with a carbide-forming element, to produce structures of a similar character, and it was in this sense that the speaker had referred to the possible use of aluminium.

There was another consideration which struck him. Discussing the question of various elements and their influences, he understood the lecturer to say it was necessary that one element of a certain type must be balanced against an element of a totally different type so as to ensure that there was not present an excess of a carbide-forming element. That need agreed entirely with the views he (Dr. Chubb) had already expressed, but the lecturer had then gone on to say that it was particularly essential to eliminate the harmful influences of lead carbide. That statement raised the question whether any lead carbide ever really existed in cast iron. Since lead and ferrous materials, such as cast iron and steel, are immiscible in both the liquid and the solid states, he would be interested to know in what manner this metal could be alloyed to produce a carbide in cast iron.

MR. BRAIDWOOD said he could not agree with the questioner with regard to the first point. Production of the acicular structure was a function of transformation characteristics and not of carbide-forming *versus* graphitising propensities. He had not experimented with aluminium to replace nickel in acicular irons and did not regard such replacement as at all likely to give satisfactory results.

In answer to Dr. Chubb's second point, he said that he had warned against the presence of lead because experience has shown this element to have definite carbide-forming tendencies. Foundrymen who have made use for melting or pouring of iron, of crucibles or ladles previously employed for melting or pouring of lead-containing alloys will have had some experience of the difficulties which the presence of lead can cause in the form of hard sections. The warning is a general recommendation for cast irons and was given in this case, not because of any influence on transformation characteristics, but because castings might be produced with hard sections, so impairing machinability.

Vote of Thanks

MR. C. D. POLLARD, proposing a vote of thanks to Mr. Braidwood, said they must congratulate him on the manner in which he had prepared and delivered the Paper, and in particular the excellent way in which he had tackled and answered the questions during the discussion. Those who had had the privilege of working with Mr. Braidwood knew before they came to the lecture what a treat was in store, and they had not been disappointed.

It was not universally agreed that it was necessary to put nickel into cast iron in order to make good castings, but when a man like Mr. Braidwood talked on such a subject his audience knew he would have been thorough in his study of it and in consequence would have confidence in what he was saying. Therefore, on behalf of the visitors and members he formally proposed a most hearty vote of thanks to Mr. Braidwood.

MR. NICOL SMITH, seconding, said he had known Mr. Braidwood for a long time, but had never heard him lecture before. He hoped to have that pleasure again on many occasions, for this lecture had cleared up a lot of misconceptions and, he was sure, had helped many members considerably.

What is Acicular Cast Iron?

He always reproached himself whenever acicular cast iron was mentioned because he had produced acicular structures as far back as 1937 without realising their significance. He had then made a series of manganese/molybdenum irons, and he had observed a beautiful series of structures, such as they had been shown, of under-alloyed acicular iron. It always seemed to him, and it applied to all of those who might earlier have made acicular iron without realising just why or how, that some of these phenomena could not be developed before their time. It needed a lot of research before one understood exactly why certain structures were produced, and he did not think it was possible to have had a clearer explanation than that which Mr. Braidwood had given them.

MR. BRAIDWOOD thanked the members for their reception of the Paper. It was easy and exhilarating to prepare and present a Paper on some exciting, readily-illustrated subject, but when it was necessary to deal, in public, with considerations of "intermediate structures" and the like, the task was one of some difficulty. If he had answered the title question without blinding the audience with science or becoming fogged himself, then he was very happy indeed.

* * * * *

On page 689 of last week's instalment of this article, when describing the gating arrangements for a six-throw Diesel crankshaft, we printed that a static head of about 20 ft. was used. This, of course, should have read 20 in.; we apologise for any inconvenience caused by this error.

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Light Metal Founders' Association

Tenth Anniversary Dinner

In celebration of the tenth anniversary of the first meeting of the Technical Committee of the Light Metal Founders' Association, a theatre party and dinner took place in London on November 30. Most of the members of the original and this year's Committee were present. Mr. J. F. Paige, the chairman from 1939 to 1945, and the present chairman, Mr. L. Fletcher, in interesting speeches referred in detail to the excellent work done throughout the ten years.

Mr. G. A. Woodruff, the first chairman of the Light Metal Founders' Association, who held office from 1939 to 1946, and the present chairman, Mr. A. H. Sturdee, who both were guests of the Committee, also referred to the valuable services the Technical Committee had rendered in many directions to the light-alloy foundry industry. They expressed the thanks of the general body of members to the Committee for its outstanding work on their behalf—it had been one of the strongest features of the Association's activities.

A pleasant interlude during the evening was the presentations made to Mr. T. W. Fisher, of Heathcote & Coleman, in appreciation of his services as secretary to the Committee since its inception. Mr. Fisher, in a witty speech, suitably acknowledged the gifts.

Historical Background

On November 30, 1939, the Technical Committee of the Light Metal Founders' Association held its first meeting at the offices of the Light-alloy Castings Control, Birmingham. The Committee consisted of representatives of the larger firms of light-alloy founders and was appointed by the Light Metal Founders' Association. This Association was formed at the suggestion of the late Mr. Percy Pritchard, who, as the wartime Controller of this section of the industry, desired a definite body with which to deal, so that the light-alloy founders would have a means of speaking and acting as a whole.

To meet wartime needs, some of the first questions considered and dealt with by the Technical Committee were:—(1) The possibility of classifying castings according to the duty they have to perform, or the properties they are required to possess; (2) the types of alloys which may be considered to fill a given specification in each case, and (3) the reduction of those alloys to the smallest possible number in each class.

Book Review

Aluminium and Magnesium Design and Fabrication. By R. Burt Schulze. Published by McGraw Hill Publishing Company, Limited, Aldwych House, London, W.C.2. Price 64s.

This 16-chapter book has been written to provide ". . . a practical approach to light-metal product design and fabrication." The Author is supervisor of manufacturing development and research of a well-known American aircraft constructor and this is probably the reason for a certain out-of-balance which has resulted. He states that the book is his attempt to supply a basis of study of the subject of light metal in relation to fabrication and that he has not included information that is already familiar, for example, because processes are used on aluminium and magnesium as well as on other metals. This has not been invariably followed, however, for on page 465 well-known standard details of oxy-acetylene welding equipment are included.

The scope of the work is well shown by the chapter headings, some of the sections being among the best of their kind hitherto available to the reviewer. The first two chapters summarise the general properties of the light metals and deal briefly with the theory of forming in relation to these characteristics. A brief chapter on machining is followed by one on experimental forming methods which, in turn, is followed by six chapters which can be considered as forming the main body of the book. They are all headed "Limited-production Forming" and deal successively with the use of routers and shapers, the press brake, the rubber press, hydraulic and mechanical presses, the drop hammer, stretch presses and contour roll formers. These six chapters give a great deal of valuable practical information, fully illustrated by line drawings (curves and photographs of actual operations, tools and typical components.

The chapter headed "Mass-production Forming Methods" provides only a brief discussion of this very considerable subject and deals principally with assembly procedures, tooling, and the use of fixtures. Two chapters are devoted to fastening methods, the first covering mechanical fastenings, chiefly rivets for which the data given are confined almost entirely to rivets up to $\frac{1}{4}$ in. diameter. The chapter on welding and brazing is sufficient to provide a general review, without, however, giving all the information required by designers of welded assemblies.

"Cost Analysis" is a useful summary illustrated by tabulated data for representative operations on presses, spot welders and other machines. The final two chapters deal with "General Design Principles" and "Design Applications." The data provided and the examples in each chapter are limited to small assemblies which are by no means representative of the wide range, or the most appropriate applications, of the light metals. The most important omissions appear to be in connection with castings and extruded sections. There is a 4-page mention of castings which cannot deal adequately with the casting processes, design considerations for castings, applications of the different types of casting or relative costs between castings made by the different processes or between castings and fabricated work. The design and use of extruded sections is one of the most important aspects of the economical use of aluminium but is limited by the Author to less than five pages.

It must, however, be stated in fairness that the book is an excellent one providing the reader realises it is confined almost exclusively to sheet and strip material. The word "design" has been considered almost entirely from the point of view of fabrication for production engineering and the many illustrations, numbering several hundred, form a most valuable feature of the Author's discussions on this theme. The explanations of the basic principle of design in relation to manufacturing methods are sound and are supported by tabulated data and diagrams. The limitations of the processes are set out fairly and thoroughly, although certain minor points may not be always agreed—for example, commercial-purity aluminium is not regarded as being completely suitable for resistance welding unless the machines available have sufficient power to offset the high electrical conductivity—a point not clearly made in this section of the book. As may be expected, the standard of production of the book is extremely high and the index is adequate. It is certainly worthy of a place on the bookshelf or desk of the designer, production engineer, manufacturer, and student in many technological fields and engineering industries.

E. G. W.

Publications Received

Bronze and Brass Castings for the Motor Car Industry. Published by the Society of Motor Manufacturers & Traders, Limited, 148, Piccadilly, London, W.1.

This booklet sets out about fifteen specifications covering the major—thorugh not all—cast non-ferrous requirements of the motor-car industry. It has been produced in collaboration with the Association of Bronze and Brass Founders. In addition to chemical composition and mechanical properties, typical applications are listed for most alloys. Readers requiring copies should write to the Association of Bronze and Brass Founders, 25, Bennetts Hill, Birmingham, 2.

Fires Involving Dusts. Issued by the Fire Protection Association, 84, Queen Street, London, E.C.4.

This interesting brochure deals with 91 fires, of which 33 relate to magnesium and aluminium dusts. Most dust fires are caused through sparks or friction inside machines. The presence of a foreign body can obviously cause friction and explosion, therefore, strict plant maintenance, good housekeeping, and the initial provision of well-made machinery are the best safeguards. The brochure is available to our readers on writing to Queen Street.

Blasting (Castings and Other Articles) Special Regulations, 1949

Details of New Order

The Minister of Labour and National Service has made the following Special Regulations relating to blasting of castings and other articles.

Part I covers paragraphs under the headings: "short title, commencement and revocation"; the "interpretation," "definitions," "application," and "exemptions." Under this latter title are included:—

(1) If the Chief Inspector is satisfied that in any factory, or in factories of any specified class or description, the use of sand or other substance containing free silica as an abrasive in blasting is necessary for a particular manufacture or process (other than a process incidental or supplemental to the making of metal castings), he may by certificate in writing (which he may in his discretion revoke at any time) as respects that manufacture or process exempt that factory or factories of that class or description from the application of Part II of these Regulations either absolutely or subject to such conditions as may be specified in the certificate.

(2) If the Chief Inspector is satisfied in respect of any factory or in respect of factories of any specified class or description that owing to the special conditions or special methods of work or otherwise any requirement of these Regulations can be suspended or relaxed without danger to the health of the persons employed, or that the application of any such requirement is for any reason impracticable or inappropriate, he may by certificate in writing (which he may in his discretion revoke at any time) exempt that factory or factories of that class or description from the application of that requirement either absolutely or subject to such conditions as may be specified in the certificate.

(3) Where any certificate is issued under this Regulation a legible copy thereof, showing the conditions (if any) subject to which it has been granted, shall be kept posted up in every factory to which the exemption applies in a position where it may conveniently be read by the persons employed.

Part II states that no sand or other substances containing free silica shall be introduced as an abrasive into any blasting apparatus.

Part III is reprinted from the Order:—

Blasting to be done in blasting enclosure

Blasting shall not be done except in a blasting enclosure, and no work shall be performed in a blasting enclosure except blasting and work immediately incidental thereto and the cleaning and repairing of the enclosure and of plant and appliances situated therein. Every door of a blasting enclosure shall be kept closed while blasting is being done therein.

Maintenance of blasting enclosure

Blasting enclosures shall be constantly maintained in good condition and all practicable measures shall be taken to prevent dust escaping from such enclosures, and from any apparatus connected therewith, into the air of any room.

Provision of separating apparatus

There shall be provided and maintained in connection with every blasting enclosure efficient apparatus for separating, so far as practicable, abrasive which has been used in blasting apparatus and which is to be used again as an abrasive from dust or particles of other material arising from blasting, and no such abrasive shall again be introduced into blasting apparatus until it has been so separated:

Provided that this Regulation shall not apply (except in the case of blasting chambers) to blasting enclosures constructed before the making of these Regulations and in connection with which it is not reasonably practicable to provide apparatus in accordance with this Regulation.

Provision of ventilating plant

There shall be provided and maintained in connection with every blasting enclosure efficient ventilating plant to extract, by exhaust draught effected by mechanical means, dust produced in the enclosure and to remove and dispose of such dust so that it shall not escape into the air of any room; and every bag used for filtering the dust and every other filtering or settling device situated in a room in which persons are employed other than persons attending to such bag or other filtering or settling device shall be completely separated from the general air of that room in an enclosure ventilated to the open air.

Operation of ventilating plant

The ventilating plant provided for the purposes of Regulation 9 of these Regulations shall be kept in continuous operation whenever the blasting enclosure is in use whether or not blasting is actually taking place therein, and in the case of a blasting chamber shall be in operation when any person is inside the chamber for the purpose of cleaning or repair work.

Inspection and examination of blasting enclosures, apparatus and ventilating plant

(1) Every blasting enclosure shall be specially inspected by a person competent for the purpose in every week in which it is used for blasting. Every blasting enclosure, the apparatus connected therewith and the ventilating plant provided in connection with the enclosure shall be thoroughly examined and, in the case of ventilating plant, tested by a person competent for the purpose at least once in every month.

(2) Particulars of the result of every such inspection, examination and test shall forthwith be entered in a register which shall be kept in a form approved by the Chief Inspector and shall be available for inspection by any workman employed in or in connection with blasting in the factory. Any defect found on any such inspection, examination or test shall be immediately re-

ported by the person carrying out the inspection, examination or test to the occupier, manager or other appropriate person and without prejudice to the foregoing requirements of these Regulations shall be remedied without avoidable delay.

Provision of protective helmets, gauntlets and overalls

(1) There shall be provided and maintained for the use of all persons who are employed in a blasting chamber, whether in blasting or in any work connected therewith or in cleaning inside such a chamber, protective helmets of a type approved by certificate of the Chief Inspector; and every such person shall wear the helmet provided for his use while he is in the chamber and shall not remove it until he is outside the chamber.

(2) Each protective helmet shall carry a distinguishing mark indicating the person by whom it is intended to be used and no person shall wear or be allowed or required to wear a helmet not carrying his mark or a helmet which has been worn by another person and has not since been thoroughly disinfected.

(3) Each protective helmet when in use shall be supplied with clean and not unreasonably cold air at a rate of not less than six cubic feet per minute.

(4) Suitable gauntlets and overalls shall be provided for the use of all persons while performing blasting or assisting at blasting, and every such person shall while so engaged wear the gauntlets and overalls provided.

Precautions in connection with cleaning and other work

(1) Where any person is engaged upon the cleaning of any blasting apparatus or blasting enclosure or of any apparatus or ventilating plant connected therewith or the surroundings thereof or upon any other work in connection with any blasting apparatus or blasting enclosure or with any apparatus or ventilating plant connected therewith so that he is rendered liable to inhale dust which has arisen from blasting, all practicable measures shall be taken to prevent such inhalation.

(2) In connection with the cleaning operations referred to in the preceding paragraph of this Regulation and with the removal of dust from filtering or settling devices all practicable measures shall be taken to dispose of the dust in such a manner that it does not enter the air of any room. Vacuum cleaners shall be provided and used wherever practicable for such cleaning operations.

Storage accommodation for protective wear

Adequate and suitable storage accommodation for the helmets, gauntlets, and overalls required by Regulation 12 of these Regulations shall be provided outside and conveniently near to every blasting enclosure and such accommodation shall be kept clean. Helmets, gauntlets, and overalls, when not in actual use, shall be kept in this accommodation.

Maintenance and cleaning of protective wear

All helmets, gauntlets, overalls, and other protective devices or clothing provided and worn for the purposes of these Regulations shall be kept in good condition and freed so far as reasonably practicable from dust on every week-day on which they are used. Where dust arising from the cleaning of such protective clothing or devices is likely to be inhaled, all practicable measures shall be taken to prevent such inhalation. Vacuum cleaners shall wherever practicable be used for removing dust from such clothing and compressed air shall not be used for removing dust from any clothing.

Maintenance of vacuum-cleaning plant

Vacuum-cleaning plant used for the purposes of these Regulations shall be properly maintained.

Restrictions on employment of young persons

(1) No person under 18 years of age shall be employed in blasting or assisting at blasting or in any blasting chamber or in the cleaning of any blasting apparatus or any blasting enclosure or apparatus or ventilating plant connected therewith or be employed on maintenance or repair work at such apparatus, enclosure or plant.

(2) No person under 18 years of age shall be employed to work regularly within twenty feet of any blasting enclosure in which blasting is done by means of compressed air or steam unless the enclosure is in a room and he is outside that room where he is effectively separated from any dust coming from the enclosure.

Reporting of defects

If any person engaged in blasting, cleaning or other work connected with the observance of these Regulations finds any defect in any enclosure, apparatus, plant, clothing, or accommodation provided for the purposes of these Regulations, he shall without delay report the defect to the occupier, manager, or other appropriate person.

Australian Industry and German Regulations

Although Australia is entitled to only 1 per cent. by value of the total war reparations distribution of German machinery, she is, according to recent reports just received in this country, making good use of an allocation of plant which the Commonwealth Division of Industrial Development conservatively estimates to be worth £A1,000,000.

Reparation deliveries of machinery from Germany have included a modern 1,300-ton Diesel coastal ship, a large plastics press, electric motors and generators, heavy-engineering equipment, a great quantity of machine tools, plant for making ball bearings and a 5,100-ton capacity hydraulic forging press for the heaviest types of steel forgings.

THE FIRST British Industrial Finishes Exhibition is to be held at Earls Court from August 30 to September 7, 1950.

THE MOSSEND STEELWORKS of Stewarts and Lloyds, Limited, has already reached its target of 3,000 tons of steel a week for the full year. At least two-thirds of the tonnage has been manufactured into seamless tubes.

World Iron and Steel Industry

Effects of Technological Improvement and Other Factors on Employment

At its 109th session (Geneva, June, 1949), the Governing Body of the International Labour Organisation decided that the third session of the Iron and Steel Committee should be held in Geneva, starting on November 22, 1949, under the chairmanship of Mr. J. J. Ricard. Earlier, the Governing Body had laid down the following agenda for the third session of the Committee:—(1) General report; (2) guaranteed wages in the iron and steel industry; (3) technological improvement in the iron and steel industry and their effects on employment. On each of these items on the agenda the International Labour Office has prepared a separate report.

General Report

The Governing Body decided that the general report should deal in particular with (*a*) action taken in the various countries in the light of the conclusions of the second session of the Committee; (*b*) steps taken by the Office to follow up the studies and inquiries proposed by the Committee, and (*c*) recent events and developments in the industry. The general report (1) has been drawn up accordingly. Chapter I deals with action taken in the various countries and also by the International Labour Organisation in the light of the conclusions of the second session of the Committee. Chapter II is devoted to studies and inquiries undertaken by the Office at the request of the Committee. Chapter III reviews recent events and developments in the industry.

Guaranteed Wages

Report No. 2 has been prepared by the International Labour Office to assist the Committee in its consideration of the subject. Chapter I defines and describes briefly the various types of guaranteed wage and summarises the law and practice concerning them in the iron and steel industry in various countries which are members of the Iron and Steel Committee, and, in addition, gives the available information concerning experience with them and the extent to which they have been introduced in the industry in these countries. Chapter II analyses the probable costs of operating the different types of guaranteed wage in the iron and steel industry in the United States, a detailed inquiry into which was undertaken as a part of the United States Guaranteed Wage Study of 1946-47, and estimates the proportions which such costs form of the value of sales and of production costs in the iron and steel industry. Chapter III discusses the relationship between the guaranteed wage and unemployment insurance. Chapter IV lists some questions concerning the application of the guaranteed wage in the iron and steel industry which appear to require further study.

Report No. 3 embodies information received by the Office from a large number of countries emphasising the shortage of labour in iron and steel industries and the abundant opportunities for the re-employment of any workers who may be temporarily displaced as a result of technological changes. It would, however, be a short-sighted view, states the report, to suppose that these conditions, to the extent that they still persist, make the present report untimely. Until recently, the demand for iron and steel products has been swollen by the needs (*a*) for replacing or restoring war-shattered equipment; (*b*) for overhauling wartime arrears of ordinary replacements and renewals, and (*c*) for meeting the requirements of ambitious post-war expansion programmes. In some countries this state of affairs continues, but in many countries it appears now that the arrears in the demand for steel have been largely met. It is natural, especially in view of the past history of the industry, that considerable anxiety should be felt as to whether the demand for steel will remain high enough to maintain employment at present levels, or at the even higher levels which may be reached in the course of expansion programmes.

Iron and Steel Demand

If high levels of income and employment in general can be maintained throughout the world, it seems reasonable to take an optimistic long-term view of the prospects of expansion in the demand for iron and steel. Throughout the world there is a vast unsatisfied demand for steel for mechanical engineering, for the production of motor-cars, ships, locomotives and rolling stock, for electric power equipment, for building and construction, for agricultural implements, for oil pipelines, and for other purposes. To enable the people of other countries to consume even half as much steel per head per year as is used in the United States would keep vastly augmented labour forces fully employed in iron and steel industries for generations to come. All these considerations support the view of the Committee for European Economic Co-operation in 1947 that any reduction in one sector of the demand for steel "will be counterbalanced by the normal upward curve of consumption, so that although there may be a flattening out of demand for a year or two in the early 1950's, after that the curve will rise again."

The report states that it is greatly to be hoped that the course of events will approximate to this pattern, and there is no need to sound a note of alarm. But it is appropriate and prudent that the steel industry should now prepare to meet, with a minimum of hardship to workers, at least a temporary recession in the demand for iron and steel products. Even in countries in which no general recession in the demand for steel may occur, it may still be necessary to promote considerable movements of workers from place to place and from job to job within the industry.

THE LARGE BLAST FURNACE of the Hermann Göring works of Linz, Austria, dismantled and transported to Lulea, Sweden, is now being rebuilt there for the Norrbotten Ironworks. It is expected to raise production capacity from 250,000 metric tons to 300,000 tons of pig-iron a year, making Norrbotten the biggest ironworks in Sweden. Investment calls for a total expenditure of 200 million kronor (about £14 million).

Parliamentary

Output of Cast-iron Pipes and Foundry Iron

Asked by MR. M. MACPHERSON whether he was aware of the shortage in Scottish housing schemes of cast-iron piping, and particularly of pipe bends, and what steps he was taking to increase production, the MINISTER OF SUPPLY replied: "Yes. There is a general shortage of cast-iron pipes and fittings. Annual production has increased since 1947 by about 100,000 tons, and it is hoped that there will be a further increase of over 30,000 tons in 1950."

Replying to a further question by MR. MACPHERSON, the MINISTER said that 1,532,147 tons of foundry pig-iron were produced in the United Kingdom during the 12 months ended October, 1949, against 1,387,080 tons for the similar period ended October, 1948; a further increase to 1,550,000 tons was expected during the 12 months ending October, 1950.

Accident Rate in Foundries

When MR. MACPHERSON asked the Minister of Labour what correlation there was between the accident rate and working conditions in iron and steel foundries, MR. ISAACS said that, although it was reasonable to suppose that, in iron and steel foundries as elsewhere, the accident rate was affected by working conditions, he knew of no data on which a precise correlation could be based. The factory inspectors' report, which would shortly be issued, would show that they had done a tremendous amount of investigation work in this field in the last few months.

MR. HENDERSON STEWART: "Does the Minister mean by that answer that the employers in those factories are, in fact, making a substantial effort to improve conditions?"

MR. ISAACS: "Most decidedly."

"Steel no longer in Short Supply"

Referring to the issue of licences for steel for the home market, Sir Ellis Hunter, president of the British Iron and Steel Federation, speaking in his capacity as chairman of the company at the annual meeting of Redpath, Brown & Company, Limited, Edinburgh, said that the steel supply position, except in certain materials which the company did not use, was no longer really stringent. There was, in fact, he said, undue emphasis on shortages of steel.

"Habits of mind created by the acute scarcity which existed two or three years ago—a scarcity which has now passed—tend to persist in official quarters and are apt to result in some projects being unnecessarily diverted to other forms of construction." Sir Ellis said that there had been marked improvement in the issue of licences for export work, removing one of the principal difficulties which hampered the company's efforts to secure more overseas work.

The transfer of the steel industry to the State, he added, could not benefit the structural-engineering industry, and "would almost certainly adversely affect its prospects."

Obituary

THE DEATH HAS OCCURRED of Mr. Bernard Andrew Bashforth, managing director of Charles Butcher & Company, Limited, Durham Iron Foundry, Sheffield.

MR. WILLIAM BINDLEY BRIGGS, who died recently at the age of 74, was chairman of S. Briggs & Company, Limited, engineers and ironfounders, of Burton-on-Trent.

MR. EDWARD STEVENSON, who owned his own foundry in Burrows Street, Nottingham, until he retired several years ago, has died at Plumtree, Notts. He was a life member of the Nottingham Society of Engineers.

MR. ALBERT E. BAKER, who until his retirement two years ago was in charge of production at the West Hartlepool works of the Expanded Metal Company, Limited, has died. He was 73. Mr. Baker had been connected with the company for 58 years.

MR. WILLIAM M. DICK, manager in Scotland for more than 20 years of the Stanton Ironworks Company, Limited, died suddenly at his home in Glasgow on December 5. He was a son of Mr. John Dick, of John Dick & Son, iron merchants, Grangemouth, and was well known and highly esteemed in the foundry industry in Scotland; he joined the Scottish branch of the Institute of British Foundrymen in 1936.

Wills

WILSON, JOSEPH, Carronside Street, Falkirk, a former moulder	£3,2[illegible]
BROWN, JAMES, Falkirk ironfounder, of Easter Livilands, Stirling	£216,818

Carbon-lined Blast Furnaces

Scunthorpe Celebration

About 100 members of the production staff of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited) and their wives were the guests of Mr. Tom Marshall, of Thomas Marshall & Company (Loxley), Limited, and Carblox, Limited, at a recent party at the Wortley hotel, Scunthorpe, given to celebrate the blowing-in of the Appleby-Frodingham all-carbon-lined blast furnaces—the first in the world.

Referring to a recent trip to America by Mr. George Elliot, works manager (iron) of the Appleby-Frodingham Steel Company, Mr. Marshall said: "It is not everyone who can tell the Yanks how to do the job. We have been successful in a magnificent achievement—so magnificent that your Mr. Elliot has been to America to tell them all about it."

Thanking Mr. Marshall, his brother (Mr. Arthur Marshall) and other directors and representatives of Carblox, Limited, for their hospitality, Mr. Elliot said that they had met to celebrate two very important things. First, the blowing-in of the first two all-carbon blast furnaces in the world, which was something of which they could all be very proud, and, secondly, the several years' close co-operation between the Carblox company and Appleby-Frodingham.

Increases of Capital

Details of increased capital have been announced by the following companies:—

QUALCAST, LIMITED, Derby, increased by £250,000, in 5s. ordinary shares, beyond the registered capital of £325,000.

GLOVER & MAIN, LIMITED, London, S.W.1, increased by £250,000, in £1 ordinary shares, beyond the registered capital of £500,000.

MUREX, LIMITED, Rainham, Essex, increased by £1,000,000, in £1 ordinary shares, beyond the registered capital of £1,650,000.

G. CLANCEY, LIMITED, ironfounders, etc., of West Bromwich, increased by £49,000, in £1 ordinary shares, beyond the registered capital of £2,000.

EIFFEL FOUNDRY COMPANY, LIMITED, Walkden, Lancs, increased by £13,000, in £1 ordinary shares, beyond the registered capital of £2,000.

S. J. BARNETT & COMPANY, LIMITED, metal merchants, etc., of London, W.C.1, increased by £45,000, in 5s. ordinary shares, beyond the registered capital of £5,000.

WHESSOE, LIMITED, Darlington, increased by £550,000, in 1,200,000 ordinary and 1,000,000 unclassified shares of 5s. each, beyond the registered capital of £450,000.

W. WOODCOCK, SONS & COMPANY, LIMITED, iron and brass founders, etc., of St. Helens, Lancs, increased by £19,000, in £10 shares, beyond the registered capital of £6,000.

HEAD, WRIGHTSON & COMPANY, LIMITED, engineers and foundrymen, of Thornaby-on-Tees, increased by £100,000, in £1 ordinary shares, beyond the registered capital of £1,000,000.

F. & M. SUPPLIES, LIMITED, manufacturers of oils, powders, etc., for foundries, of London, E.14, increased by £9,000, in £1 ordinary shares, beyond the registered capital of £1,000.

DANIEL DONCASTER & SONS, LIMITED, steel and iron merchants, steelmakers and converters, etc., of Sheffield, increased by £400,000, in £1 ordinary shares, beyond the registered capital of £100,000.

J. B. & S. LEES, LIMITED, ironmasters, etc., of West Bromwich, increased by £180,000, in 80,000 4½ per cent. cumulative preference and 100,000 ordinary shares of £1 each, beyond the registered capital of £120,000.

DAVEY, PAXMAN & COMPANY, LIMITED, mechanical, electrical, and general engineers, etc., of Colchester, increased by £300,000, in 175,000 ordinary and 125,000 unclassified shares of £1, beyond the registered capital of £700,000.

RUSTON-BUCYRUS, LIMITED, excavating machinery manufacturers, etc., of Lincoln, increased by £800,000, in 400,000 "A" ordinary and 400,000 "B" ordinary shares of £1 each, beyond the registered capital of £800,000. The shares are held between the Bucyrus Erie Company, of Wisconsin, U.S.A., and Ruston & Hornsby, Limited, Lincoln.

MIRRLEES, BICKERTON & DAY, LIMITED, Diesel-engine manufacturers, etc., of Hazel Grove, near Stockport, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £300,000. At July 27, 1948, 150,000 shares were held by Associated British Engineering, Limited, and 249,998 by District Bank (London) Nominees, Limited

New Trade Marks

The following applications to register trade marks appear in the "Trade Marks Journal":—

"'CHALLOY'"—Metallic tubing. CHALFORD ENGINEERING LIMITED, 3, Cambray, Cheltenham.

"ATEC"—Hollow-ware. ANDREWS TECHNICAL EQUIPMENT, LIMITED, 260, Glenfrome Road, Bristol.

"LIVEDENT"—Metal moulds for plastics. LIVEDENT PLASTICS, LIMITED, 32, Stanley Street, Southport.

"SLIX"—Chemical products used in the foundry industry. FOUNDRY SERVICES, LIMITED, 285, Long Acre, Nechells, Birmingham, 7.

"PARAGEN"—Furnaces and plant for the heat-treatment of metals. WILD-BARFIELD ELECTRIC FURNACES, LIMITED, Elecfurn Works, Watford By-Pass, Watford.

"ROLSAN BRAND ALUMINIUM HOLLOWARE"—Aluminium hollow-ware. ROLSAN ENGINEERING, LIMITED, 249, Umberslade Road, Stirchley, Birmingham.

Company Results

(Figures for previous year in brackets.)

WHESSOE—Interim dividend of 5% on doubled capital (10%).

IRISH ALUMINIUM COMPANY—Net profit to September 30, after tax, £9,399 (£4,474); fees, £2 (£1); dividend of 10% (5%); forward, £23,253 (£14,945).

ANGLO-GREEK MAGNESITE COMPANY—Net group deficiency to March 31, £9,421 (£2,439); retained by a subsidiary, £2,439 (£1,186); credit forward on holding company's account, £1,985.

FAIRFIELD SHIPBUILDING & ENGINEERING COMPANY—Trading profit for the year ended June 30, £599,126 (£458,804); balance, after depreciation, tax, etc., £195,449 (£131,440); dividend of 10% (same); to contingencies, £125,678 (£75,615); forward, £203,236 (£155,465).

ATLAS STEEL FOUNDRY & ENGINEERING COMPANY—Trading profit for the year ended September 30, £48,978 (£52,803); balance, after tax, etc., £47,593 (£41,052); brought in, £16,832 (£11,425); to development reserve, £30,000 (£20,000); final dividend on capital increased by 33⅓% capital bonus of 21⅔% (17½% and bonus of 10%), making 36⅔% (42½%); forward, subject to directors' fees, £20,847.

ANTI-ATTRITION METAL COMPANY—Consolidated manufacturing profit for the year ended July 31, £10,647 (£51,013); loss, after depreciation, etc., £2,989 (profit £37,394); brought in, £16,967 (£18,060); unrequired provision, £6,150 (nil); from tax reserve, £4,000 (nil); dividend reserve, £7,500 (nil); realised on insurance policies, £390 (nil); available, £35,007 (£60,117); to pensions, £500 (same); tax reserve, nil (£18,150); dividend reserve, nil (£2,500); dividend of 10% (same); forward, after deducting loss, £9,518.

J. BROCKHOUSE & COMPANY—Group net trading profit to September 30, £535,065 (£822,203); net profit, after tax, depreciation, etc., £169,665 (£299,237); net realisation investments and lease, £6,147 (£142); profit on sale of subsidiary, nil (£38,105); off preliminary expenses, £93 (nil); investments provision, nil (£21,000); retained by subsidiaries, £17,674 (£19,138); parent company, £158,045 (£297,346); final dividend of 12½%, making 20% (same on smaller capital); staff superannuation fund, nil (£5,000); forward, £400,888 (£387,555).

New Patents

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 2s. each. The numbers given are those under which the Specifications will be printed, and all subsequent proceedings will be taken.

622,167 PLASCO, LIMITED. Method and apparatus for forming and trimming diecastings.

622,177 SMIDTH & COMPANY AKTIESELSKABET, F. L. Purification of limestone.

622,240 HARVEY, W. G. Method and apparatus for casting metal.

622,330 NEW CONVEYOR COMPANY, LIMITED, SMITH, J. V., and AITCHISON, J. Machines for use in making foundry sand moulds.

622,419 POTTS, F. C. (Linde Air Products Company). Desulphurisation of molten ferrous metal.

Gazette

LIBREX LEAD COMPANY, LIMITED, is being wound up voluntarily. Mr. J. A. Raine is the liquidator.

WILLIAM HEYWOOD & SON, LIMITED, ironfounders, is being wound up voluntarily. Mr. H. Lord, 25A, Drake Street, Rochdale, is the liquidator.

COOKSON LEAD & ANTIMONY COMPANY, LIMITED, is being wound up voluntarily. Mr. G. O. Petersen, 140, Stanfordham Road, Westerhope, Northumberland, is the liquidator.

LOCKE, LANCASTER & W. W. & R. JOHNSON & SONS, LIMITED, lead manufacturers, is being wound up voluntarily. Mr. K. H. Johnson, Ibex House, Minories, London, E.C.3, is the liquidator.

British Standards Institution

Addendum to Standard for Conversion Factors and Tables

This addendum No. 1 to B.S. 350:1944 (PD.957) contains additional definitions, conversion factors, multiples and tables relating to cubic measures, weights, pressures, force, concentration, and traffic units; a set of factors and multiples and a few extended tables for the conversion of units of thermal conductivity and conductance, heat flow and viscosity.

Attention is also directed to the use which can be made of many of the basic tables, included in B.S. 350:1944, for the conversion of derived units. All the tables provide for two-way conversions, and as the conversion factor in the one table is the reciprocal of the conversion factor in the other, the table for converting miles to kilometres, for example, can also be used to convert units per kilometre to units per mile. This also applies to costs and the table for converting kilograms to pounds can be used to convert cost per pound to cost per kilogram, and so on.

At the request of users of B.S. 350, the addendum contains an index of the definitions, factors, and tables included in the two books. Copies of the addendum may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, price 2s. post free. The price of B.S. 350:1944 is 5s. post free.

Methods for the analysis of plain carbon steels, low-alloy steels and cast irons, B.S. 1121, *Parts* 15 16*:* 1949

The British Standards Institution has recently published the following additional parts to B.S. 1121—Methods for the analysis of steel:—Part 15, silicon in plain carbon steels, low-alloy steels and cast irons (absorptiometric method), and Part 16, manganese in iron and steel. Copies of these standards may be obtained from the sales department of the Institution, at a cost of 1s. each, post free.

Safety Precautions in using Chemicals for Metallurgical Analysis (*B.S.* 1121*A:* 1949)

The British Standards Institution has recently published the first two sections of B.S. 1121A—Safety precautions in the use of laboratory chemicals for metallurgical analysis.

This is intended to provide that working conditions and procedure in laboratories are such as to minimise the chances of serious accidents, and to act as a medium of instruction in the safe handling of laboratory chemicals.

Several sections will be issued and the sequence of presentation will follow, as far as possible, references to the use of particular reagents in B.S. 1121. Sections I and II relate to general requirements and to precautions in the handling of perchloric acid. Copies of this standard may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, price 1s., post free.

News in Brief

GEORGE KENT, LIMITED, are planning to extend their foundry at Luton, Beds.

RAPID MAGNETTING MACHINE COMPANY, LIMITED, Lombard Street, Birmingham, 12, manufacturers of permanent and electro-magnetic separating and lifting equipment, announce that their telegraphic address will in future be Magnetism Birmingham 12.

THE LONDON BRANCH of the Institute of British Foundrymen, at their meeting last week, were honoured by the presence of Mr. P. L. Ward, B.Sc., of African Malleable Foundries, Limited, Benoni, a past-president of the South African branch. After a lengthy business visit to this country, Mr. Ward left for home by air on December 10.

THE BOARD OF TRADE point out that the 3 per cent. increase in manufacturers' prices authorised by the General Hollow-ware (Maximum Prices) Order, 1949, applies only to hollow-ware usually made from blackplate or steel sheet and tinned in its finished state and not to hollow-ware made from tinplate, for which no such increase has been authorised.

BORAX CONSOLIDATED, LIMITED, announce a further revision of prices as compared with those printed last week. Prices ruling for despatches since December 1 are now £35 10s. for granular borax, technical (commercial) quality; £63 for granular boric acid, technical quality and £55 for anhydrous borax; prices are net per ton with the usual surcharges for smaller quantities.

Industrial Glass Film

Last week, in London, members of the technical Press were invited by Pilkington Bros., Limited, St. Helens, Lancs, to a preview of a new film advertising their industrial glass and produced for them by the Cecil Musk Productions. The title is "'Armourplate' and 'Armourlight,'" and refers to specially-toughened plate glass and moulded glass respectively. The film runs through manufacturing principles and practical works' methods, and concludes its 20 minutes or so of running time with examples of using the glass in factories, schools, offices, ships, railways, etc.—in fact, wherever glass is required to be subjected to high heat or physical shock.

The whole was impressively demonstrated, very well produced and there were no discordancies; in particular, the shots in iron and steel works, where the glass is used, *inter alia*, for control-cabin windows, inspection doors and the like, were very authentically reproduced. Of interest to stove manufacturers was the use of the material for oven doors, permitting visual examination of the contents. Other applications for foundrymen are its use in tuyere windows for furnaces, in crane-cab windows and for protective screens for grinders.

The film is on 16-mm. stock and copies are available for showing to technical and scientific societies and similar organised bodies on application to the publicity department at St. Helens, or to the regional offices.

Raw Material Markets

Iron and Steel

Activity in the foundry trades, though somewhat below its peak, is at a sufficiently high level to sustain a steady demand for the usual range of pig-iron. High-phosphorus iron is now available in quantities which are adequate for current needs. Low- and medium-phosphorus grades are also more readily obtainable and, although the production of hematite is fully absorbed, there are no complaints of any shortage.

There are still substantial tonnages of imported steel semis to be converted into finished material and, as the volume of employment in the re-rolling industry is on a reduced scale, there has been a marked relaxation in the demand for further supplies of billets, blooms, slabs, etc. A regular call for sheet bars is being encountered and small billets are also needed, light re-rollers being still well supplied with specifications for small sections and bars and narrow strip.

Some of the plate mills have received increased export quotas, but it is not easy to fit these into heavy rolling programmes and it is feared that at the end of the year many home consumers will find that their deliveries for the fourth period fall short of their allocations. It would appear that maximum outputs will be required from the plate mills for a long time ahead. The big rail order, the receipt of which from British Columbia was announced last week, is indicative of the extensive world demand for railway material, but there has been a decline of interest in sectional material and bars. The tube trade is fully booked on overseas contracts and locomotive, wagon, and boiler shops are all busy.

Non-ferrous Metals

The British Bureau of Non-ferrous Metal Statistics has published the October figures for the United Kingdom, and these make quite good reading, although there was less activity during the month compared with September. In copper, total consumption was 41,560 tons, or about 2,500 tons less than the previous month; while the usage of secondary copper and copper in scrap was virtually unchanged, consumption of virgin metal fell to 27,027 tons, which is, however, still above the average for the 10-month period. Stocks of copper again declined, the October figure of 143,867 tons comparing with 145,236 tons at September 30 and 149,948 tons at the end of August.

In zinc, total stocks at the end of October were down to 65,114 tons, compared with 73,862 tons at September 30 and no less than 81,718 tons at July 31. Rather more than half the total was in the form of "Prime Western" and G.O.B. brands. Consumption of zinc declined from 26,181 tons in September, a figure exceeded only once this year (March, 26,704 tons), to 25,845 tons in October. In lead, October usage was 28,511 tons, or about 2,300 tons lower than the September figure. Stocks of lead also declined by nearly 4,000 tons and were given as 59,625 tons at October 31.

The decline in prices on the tin market ended on Tuesday, when gains of £3 5s. and £7 were registered respectively on the cash and forward positions. Although further increases were made on Wednesday, nevertheless, a backwardation still exists. It is disappointing that this premium for cash tin persists, for until a normal position obtains, with a contango instead of a backwardation on futures, it is impossible to attract hedging business. Without this, transactions on the Metal Exchange must inevitably reflect little more than U.K. consumers' needs.

Metal Exchange tin quotations were as follow:—

Cash—Thursday, £604 to £605; Friday, £604 to £605; Monday, £604 to £605; Tuesday, £607 10s. to £608; Wednesday, £610 10s. to £611.

Three Months—Thursday, £565 to £566; Friday, £564 10s. to £565; Monday, £565 10s. to £566; Tuesday, £573 15s. to £574 5s.; Wednesday, £583 10s. to £584.

Company News

Brown Bayley's Steel Works, Limited (MR. J. W. GARTON):—We have made application to the proper authority with a view to confining nationalisation, to such of the company's assets and liabilities as are related to the activities enumerated in the third schedule of the Steel Act. Since the end of the war the company has received permission to proceed with schemes mainly intended to concentrate processes and eliminate congestion. Progress has been difficult, but despite delay and the consequent disruption of plans, output has been kept at a high level. The first major scheme relating to the primary mill is nearing completion and will increase efficiency. The extension of the forge department will be completed this year and will then allow a concentration of equipment resulting in economy. Other projects in hand include:—New heat-treatment and warehousing bays; casting pit buildings and cranes; additional cleaning plant for gas producers; replacement of older gas-producing plant; additional melting plant. These schemes and others contemplated will involve the company in an ultimate expenditure of over £500,000. This we shall be able to find from our own resources.

The output set for ingot production has been exceeded—in fact it has been at the highest level in the history of the company. As we carry the processes through all stages to finished products, this has resulted without exception in increased departmental production.

Blythe Colour Works, Limited, Stoke-on-Trent:—The directors propose to increase the capital of the company to £275,000 by the creation of 375,000 ordinary shares of 4s. each. The sum of £37,500 is to be capitalised from reserves and applied in payment in full of 187,500 ordinary shares of 4s. each to be distributed to shareholders in the proportion of one new share for every two shares held.

Wolverhampton Die Casting Company, Limited:—The directors propose to make a capital bonus of 100 per cent. This will entail the issue of 200,000 5s. shares financed by the capitalisation of undivided profits.